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Index to Advertisers—Page xiii.

Principal Contents:

	PAGE
The B.I.F. in Progress	271
The Birmingham Exhibits Reviewed	272
New Books	277
Electrofilters for Gases	278
New Central London Showrooms	279
A.C. Meter Testing. By A. M. Strickland	280
Correspondence: Change-overs and Power Factor; Plastics for the Electrical Industry; Boiling-plate Characteristics; American Interest in Rural Work; Applying for an Appointment; Leakage Trip Settings; Refusal to Connect	282
Meetings and Discussions	284
New Apparatus and Devices	287
Business and Industrial Notes	289
Electricity Supply	293
Traction and Communications	295
Contract Information	296
Notes	297
Our Personal Column	298
Financial Section	299
Published Specifications	303
New Work for Contractors	304

Salesmen and Sales Engineers

JUST over a year ago the Electrical Development Association introduced its scheme for training electrical salesmen and saleswomen up to a standard which was to be attested by the grant of certificates and diplomas. The method is to put candidates through a specially designed postal course of domestic electricity salesmanship running over a period of six months, the tuition being conveyed to entrants by means of six handbooks bearing the main titles: "Selling Electric Service from the Consumers' Viewpoint"; "Meeting the Consumers' Needs"; "Helping the Consumer to Decide"; "Overcoming Sales Difficulties"; "Building the Domestic Electricity Load"; and "Reaching Out for New Business."

As a means of gauging the student's progress and grasp of the subject each booklet contains a leaflet bearing a "sales case." This consists of an imaginary interview between a salesman and a consumer. Questions about the salesman's procedure at each important stage are set and a number of possible answers are printed after each question, the student being asked to indicate those which he considers correct. These papers are "marked" and returned to the student with an analysis of the "case." To supplement this paper work and enable students to practise selling methods on one another and exchange experiences, the formation of "discussion groups" is encouraged by the provision of manuals for the use of group leaders.

At certain intervals students who have completed the course can sit for written examinations upon the subjects of the handbooks. Upon the results of these examinations and on their course work domestic electrical salesmanship certificates are awarded. The first examination was held last month, when over 900 candidates sat. The results have not yet been published. Having secured the certificate, a salesman (or saleswoman) can be awarded a diploma, the other qualifications being two years' sales service with a supply undertaking and a satisfactory report from the applicant's chief engineer or manager.

It will be seen that to qualify for a certificate a salesman need have no more than elementary technical knowledge of the appliances which he is selling. The scheme, however, is extended to sales *engineers*, who must necessarily possess technical qualifications and whose work is in quite a different sphere. The questions then arise: Is a course designed for the seller of domestic appliances properly applicable to such men? Or is there sufficient "pure" salesmanship (as opposed to particular applications) in the course to make it worth the sales engineer's while to pursue it?

The answer given by E.D.A. is a decided affirmative, for it is laid down as the primary requisite that until a sales engineer possesses the certificate he cannot aspire to the E.D.A. sales engineer's diploma. In addition his technical ability must be attested by a pass in one of three recognised examinations or any equivalent examination approved by the Council. This condition is to be waived until December 31st next in the case of sales engineers of five years' standing or more if the panel of examiners is satisfied that the candidate has sufficient engineering knowledge. The aspirant must also undergo a *viva voce* examination and secure a recommendation from his "chief."

It would not be surprising if there was a feeling among experienced engineers who wish to secure the diploma that they should not be expected to "return to school" with their juniors in order to gain the certificate. E.D.A.'s reply to this is that such men do not need the diploma; they are in established positions and their abilities are taken for granted.

But suppose the diploma comes to be recognised as the only hall-mark of a sales engineer and such men are desirous of changing their jobs? Will employers in the future accept them without diplomas or will their position be prejudiced? And what of the men with not quite so much service but still recognised as efficient sales engineers? Who shall define the point at which a man ceases to be qualified by his service and needs a diploma?

Such questions as these are bound to arise, and suggest that it might have been better if E.D.A. had stopped short at the training of domestic salesmen and the award of certificates instead of trying to include in the same scheme the rather different matter of the power sales engineer.

Suspense

PROMINENT men in the electrical industry are commonly suspected of knowing more than they will say about the Government's intentions with regard to distribution. Thus, at the B.I.F. luncheon on Tuesday, Mr. G. P. Achurch tried to elicit the views of Mr. W. B. Woodhouse, who, however, got no nearer to the subject than was to be inferred from the belief he expressed in the future of private enterprise—officially regulated in the public interest, it is true, but influenced to a still greater extent by public opinion. That the interest in what the Bill is likely to contain is not mere idle curiosity was forcefully expressed by Mr. W. J. Bache in his reference to the dissatisfaction born of that uncertainty which, he is not alone in believing, is damaging the industry. It would be deplorable if the spirit of reasonableness, which Mr. Woodhouse finds far more common now in electrical affairs than it was of yore, should be dissipated just at a time when a cool and unprejudiced approach to proposals that will affect the whole future of electricity supply is more than ever essential.

Loom Lighting

VIEWS on electricity from other bodies of workers are valuable for two reasons. The first is that their experience in mechanical applications covers a wider field than most electrical men can hope to compass; the second is that they can give more convincing —because unbiased—testimony to the accuracy of the claims made for electricity by its practitioners. In this way the medical profession has been of considerable service, *e.g.*, in providing the scientific basis for the "Better Light Better Sight" campaign. The latest report issued by the Medical Research Council (No. 81, Stationery Office, 9d.), dealing with the effects of conditions of artificial lighting on the performance of worsted weavers, by H. C. Weston, fully substantiates statements by illuminating engineers that output is improved by raising luminous intensity to values much in advance of those usually found at present. In one case, where the lighting had previously been regarded as satisfactory, an increase of about 25 per cent. in night compared with day weavers' personal efficiency was obtained by doubling the intensity to give 30ft.-candles on the cloth and using lamps in dispersive reflectors for general lighting.

Modern Transmission

HIGH-VOLTAGE engineering is now recognised as a special branch of technology. In this sphere the Queen Mary College has found a niche of its own, and has been chosen, appropriately, as the scene of a course of lectures to be conducted by Dr. F. T. Chapman, of the Board of Education, from September 5th to 16th for teachers of advanced electrical subjects. The work in the College has been arranged in consultation with Professor J. T. MacGregor-Morris, and will be under the general supervision of Mr. W. J. John, both of whom, in addition to other specialists, will deliver lectures. Application for admission must be made before April 30th on forms obtainable with further details from the Secretary of the Board of Education. It may be anticipated that many will be keen to take this opportunity of obtaining experience with equipment (including a million-volt impulse generator) not to be found in any other training establishment in this country.

Vehicle Radio Scheme

FOR the purpose of keeping in touch with its fleet of motor cars engaged in operation and consumers' work, a two-way radio scheme is to be introduced by the Auckland Power Board. Another is now being installed by the Sydney County Council, which, the *New Zealand Electrical Journal* states, will connect the system control room with forty-two cars. These will also be equipped with means for giving signal replies in order to save time. There are to be a central transmitter and four main station receivers connected by land lines to the control room. The scheme described would appear to be a more elaborate one than that of the London police patrol, which operates twelve vans and three cars fitted for both transmission and reception and 200 cars having reception only. If such an installation is considered justifiable in Sydney, there would appear to be an even better case for its adoption by large power companies in Great Britain.

English Electric

FOR many years the English Electric Co. had to face difficulties, but the rapid upward trend of its business during the past few years is now bearing fruitful results, and the annual report for 1937 indicates a continuance of prosperity. The ordinary dividend is resumed after a lapse of thirteen years by the payment of 10 per cent., less tax, and the company enters upon the current year with the largest order book in its history. The directors sound a note of warning regarding the continuance of the rate of expansion shown during the last few years, but they consider the prospects for the home and export markets are good. The statement by the chairman, Mr. G. H. Nelson, at the annual meeting on Tuesday that up to the present the company has had no indication of trade falling off is especially reassuring in view of the talk of a general decline in industrial activity.

Marketing Inventions

INVENTIONS fall into three general groups. In the largest come those that are fundamentally unsound, and in the other two those that are technically sound. There is this big difference between the last two groups, however. In the one case they meet a commercial need; in the other they do not, even though they may be just as ingenious pieces of engineering work. An inventor has a natural bias in favour of his idea, but usually knows little of its worth in the market, so that organisations that can give him expert views on protected ideas and also bring him into touch with men having wider business experience should save him a good deal of trouble. The arrangement that the Merseyside Society of Inventors has with the Liverpool Chamber of Commerce provides a good example of the kind of collaboration required. The Society submits particulars of inventions that seem of practical value to the Chamber of Commerce. When local development seems unlikely the information may be sent to similar bodies in other towns.

Meter Manipulation

FRAUDULENT consumers in this country are usually content to by-pass the meter, thus preventing it from registering the consumption. In Calcutta, it was revealed by a recent case, the meters were actually turned back by dexterous manipulators. This method worked well until the supply authority came across meters which appeared to be operating backwards. In one case an enthusiastic, but ignorant, "operator," working on a new meter with zero registration, turned up a row of nines, unwittingly rendering his "principal" liable for a colossal bill.

Choice of Hot-plates

EXPERIENCE at Stoke Newington has led to the conviction that the provision of radiant hot-plates would greatly assist in the development of the Council's cooker scheme. Consumers who have them are said to be "very satisfied." It was, therefore, decided on Tuesday that solid plates should be replaced, when they fail, by the radiant type. In arriving at this decision the authority has apparently been not so much concerned with the relative merits of the two types as the reactions of its consumers. Both the solid and radiant plates have their particular advantages, and this has led Mr. W. B. Parker, the author of an article "Boiling Plate Characteristics," published in our issue of February 11th, to favour a middle course in the semi-radiant plate.

The B.I.F. in Progress

Speeches at the opening and at the first electrical luncheon

SHORTLY after the opening of the London sections of the Fair on Monday last Her Majesty the Queen paid a visit to Earls Court and Queen Mary inspected the textiles shown there in the afternoon. On Tuesday the King and Queen and Queen Mary visited the Olympia display.

Owing to the political situation the Prime Minister (Mr. Neville Chamberlain) was unable to attend the B.I.F. dinner at the Mansion House on Monday evening, and Lord Derby deputised for him and read his speech. In this speech, proposing "British Industry and the British Industries Fair," Mr. Chamberlain said that the Fair showed that British manufacturers, by attention to research, invention and design, had nothing to fear from the most progressive foreign competitors.

In spite of the fact that we were no longer the only "workshop of the world" and in spite of the competition of subsidised goods and subsidised shipping, we remained one of the most important manufacturing countries and the seat of many world produce markets.

Although 1929 was generally considered to be a "boom" year, actually industrial production in the United Kingdom during last year exceeded the 1929 level by over 20 per cent. Moreover, the movement was a general one—not confined to one or two industries. At the same time imports had risen, thus benefiting foreign countries who should reciprocate by buying more British goods.

Mr. Oliver Stanley, President of the Board of Trade, in responding to the toast, said that he did not believe that there was any justification for the gloomy prophecies of a slump which had been made. Where a setback had occurred it was due to specific, not general, causes. With the shelter of a tariff system and freedom from attachment to the gold standard this country was far better equipped than it was eight years ago to face any economic or financial difficulties which might arise. It was not blind optimism that made him look forward with confidence to the coming year.

The "Electrical Review" stand at the Birmingham Section of the Fair at which readers are invited to call

The Birmingham section was declared open by the Lord Mayor of Birmingham, Councillor E. R. Canning (of W. Canning & Co., Ltd.), and Lord Dudley presided at the luncheon. The Lord Mayor remarked upon the great growth of the Birmingham Fair since its inception in 1920—from nine to 54 acres. He said that the slight decline in the number of exhibitors was due to a mistaken policy—some manufacturers were absent because of full order books.

Lord Dudley said that the Fair was even more valuable in time of industrial depression than during prosperous days when the products of industry sold themselves to a considerable extent.

It was officially stated that the attendance at Birmingham on the first day was 5,800, as compared with 5,530 on the corresponding day of the last Fair.

The First "Electrical" Luncheon

The growing necessity for some government control of industry was stressed by Mr. W. B. Woodhouse, managing director of the Yorkshire Electric Power Co., when proposing the toast of "Industry" at a luncheon held at Castle Bromwich on Tuesday on the occasion of the official visits of ten electrical associations to the Fair.

The remarkable display of commodities at the Fair, he said, left no doubt in one's mind as to the ability and assiduity of industrialists. Marketability, however, involved considerations such as the existence of a market and the price of the commodities in relation to those of competitors. The steps taken by industry to eliminate unnecessary duplication of efforts had more and more made competition an international matter and consequently State regulation of industry must be accepted, not as a painful infliction but rather as an essential for the security of trade.

Industrial security meant for those engaged in industry stability of employment and better working conditions and relations, coupled with a decrease of financial risk, but it could only be obtained to the extent to which it was accompanied by increased efficiency, the elimination of unprofitable competition and the widening of the market. Beyond that level security could only be obtained for an individual industry at the expense of the nation, and there was an obvious limit to the bolstering up of an unprofitable industry at the expense of the more prosperous.

With the increasing intervention of the State there was an increasing tendency to destroy private enterprise. Industry, however, could only thrive on change. Change involved risk and risk called for initiative and reward. No one, therefore, would wish for a static state of industry since it would inevitably result in a lower reward to workers and investors and a lower standard of living.

Visitors to the Fair could not fail to be struck by the vitality of private enterprise as indicated by the goods displayed. That initiative was the country's greatest asset and experience showed more and more that industry relied for its successful conduct on qualities peculiar to private enterprise. In no other way could quick changes of plan and the taking of risks be achieved.

In recent years the necessity had become apparent for legislation to assist in restoring industries by reorganisation and there had been a growing appreciation of the need for unification of individual industries both in production and control, not always because the existing organisations were inefficient but because the enlargement of facilities resulting from unification would present greater opportunities and result in greater efficiency.

This view was now being acted on by all the principal industries and more and more schemes of unification were being discussed. In the early days of the electric power companies the advantages consequent on large scale production were strongly opposed and claims were made that the small undertakings should maintain their independence. It had taken a very long time to get over this idea. To-day a similar change was being discussed in matters of distribution and the prospective benefits seemed to justify immediate action.

Electricity was growing in importance both with regard to existing industries and also in its potentialities for further service. He was confident that progress in the past ten years would be outstripped in the next ten and private enterprise would play a very great part in this development.

In the past monopolies were feared and distrusted. To-day every large industry was a monopoly but the new conception of industry was not inconsistent with freedom of enterprise and would, it was hoped, enable a still greater production of the world's marketable commodities.

Thanking Mr. Woodhouse for his address, Mr. W. J. Bache, president of the Incorporated Municipal Electrical Association, referred to the tendency for Government to interfere in industry and said that the present state of dissatisfaction in the electrical industry was due, not so much to fear of co-ordination but to the delay and uncertainty, which was hampering development work.

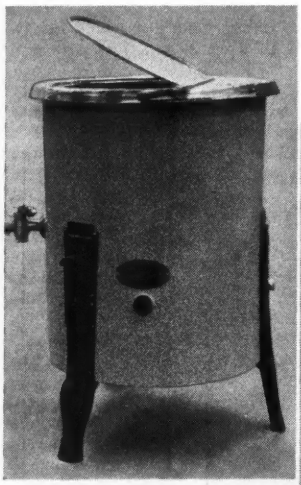
The luncheon was presided over by Mr. G. Philip Achurch, who welcomed the visitors on behalf of the Chamber of Commerce and the Fair Management Committee.

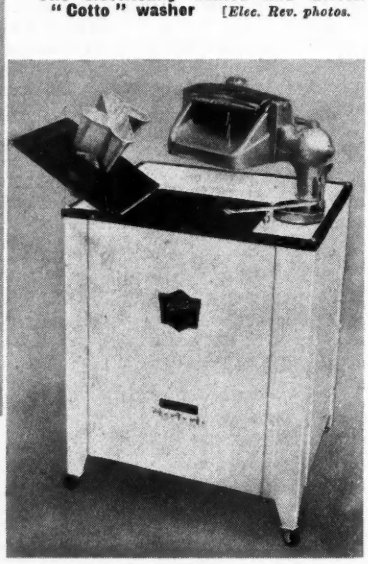
The Birmingham Exhibits Reviewed

In our last issue we gave a complete guide to the electrical and allied stands at the Fair. In the following surveys our staff representatives describe their discoveries in the domestic and industrial fields as represented at Birmingham, and pass on some views expressed by exhibitors upon the trend of development in a number of directions.

Domestic cooking and heating developments

IT was something new to hear cooker manufacturers express their conviction that automatic oven temperature control is definitely the thing of the future—apart from those staunch advocates of the early days with an overseas influence, of course. And the experience rather leaves us with the impression that the rate of development has accelerated a little commercially as compared with the slight and gradual, but definite advance of the 1935-1937 period. But we are not led to expect any particularly marked progress in the near future because the supply section of the industry must continue to hold the key.

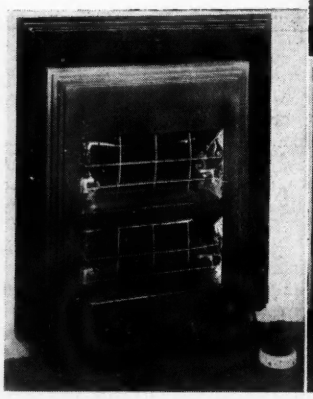


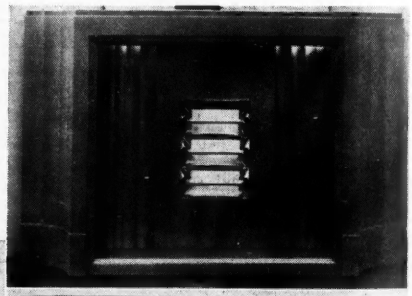


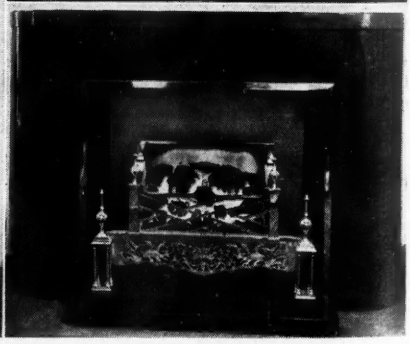
Left: The stronger legs of the "Burco" wash-boiler permit housing of switches and cable gland. Below: The electrically heated and driven "Cotto" washer *[Elec. Rev. photos.*

The Hotpoint Electrical Appliance Co., Ltd., seems to think that the recent spurt has been due to some of the smaller supply undertakings which are commencing cooker hiring schemes straight away with the thermostat, and that the larger undertakings are still holding out mainly on account of the apparent risk of increased service charges. With an eye on, say, the Lancashire Electric Power Co., we cannot accept that entirely, but it is probably a good generalisation. The Hotpoint Co. says there is no doubt about a call for the thermostat from the public, but to the manufacturer, generally the consumer is not the customer.

Moffats, Ltd., maintain that if the supply man could only look past the initial cost he would see help in connection with the service problem by reason of the extra protection given by the thermostat. It offers protection against burnt-out elements when the cook forgets to switch them off, and damage to the oven enamel as a result of overheating is guarded against too.







Left: Separate wide-angle reflectors in the Hotpoint "Abbey" fire. Top right: The Bratt, Colbran illuminated surround. Bottom right: Berry's handsome "Chippendale" solid brass fire *[Elec. Rev. photos.*

Every cooker of the main range of the English Electric Co., Ltd. leaves the factory so constructed that, as an ordinary three-heat cooker, it can be converted readily to automatic control at any future time. Supply undertakings have been very nervous about changing to automatic control, said Mr. Taffs, because of the problem of the conversion of existing cookers, but his company takes the view that the longer they defer the matter the greater will be the problem unless the cookers are so equipped as to permit easy conversion.

Easy conversion is evidently the idea behind the one-hole fixing "Revostat" of Revo Electric Co., Ltd., too. This unit is interchangeable with the standard three-heat switch and the fluid tube and bellows construction makes it only necessary to drill just one hole through the oven wall. The expansion tube in the oven rests horizontally along the back about two inches from the top, and the connecting tube outside can be bent at will to nest conveniently in the switch and fuse chamber away from the "apparatus."

The General Electric Co., Ltd., still maintains that it is better not to show actual temperature degrees on the thermostat—but arbitrary numbers—because the temperature on the oven door does not tell the whole story. Indeed it only shows the temperature where the bulb is. English Electric are believers in the oven thermometer as well because the pilot light does not tell when an element "goes down" with the current still "on." The thermometer does. The enlarged even-temperature automatic control curve will attract a good deal of attention, we should say.

To try to get a thermostat maker's point of view we asked Mr. Carter of the British Thermostat Co., Ltd., "What is your attitude towards automatic control?" He replied: "We feel that automatic control has got to come but we consider that it is not practicable to design a universal cooker thermostat applicable to every type of cooker. Both the cooker and the thermostat should be designed as the result of collaboration between the cooker manufacturer and the thermostat maker."

Some of our readers would probably like to see an automatically controlled solid-fuel heat-storage cooker. There is one at Birmingham.

In a good many minds the question of automatic control is coupled closely with oven air circulation, although much valuable work has been and is being done quite independently of the thermostat. Anyhow, the latest scheme seems to be that associated with the new Moffat "Circulaire" cooker. As we see it the idea is one for partial circulation, for there is no circulation in the sense of a "return circuit." In the lagging chamber are incorporated at the sides and near the front, vertical ducts which convey warmed air from the "exterior" bottom oven elements to the interior of the oven at the top.

Belling's ideas about oven circulation are again expressed in their new streamline cookers which have "exterior," but this time fixed elements. Slots at the top of the oven provide

circulation paths. The "Carronade" of Carron Company has side heat only, but there is a measure of forced circulation round the bottom through specially designed ducts.

There is growing trend towards the provision of a utility cupboard as an integral part of the cooker, along the lines of the colonial models. In a new Moffat cooker there is a big cupboard beside the oven, of the same depth and height as the oven, apart from the space taken by the switch box. The cupboard is not heated separately, but under the oven is a warming drawer with its own separately switched elements.

In connection with the larger models Orme, Evans & Co., Ltd., are trying to get people to take up the combined cooker, cupboard and table unit. All the kitchen pastry should be made on the specially enamelled oven top under the hinged cover. But this scheme seems to us to be essentially linked up with the company's broader ideas relating to standardised unit construction of kitchen equipment designed, as their representative put it, to take the walking out of cooking. An exhibit of a sink, a cooker and a refrigerator, in line and butting, crystallises the idea of building such equipment as a whole round the kitchen. Once the company can establish the overall size people who want the equipment will be offered complete kitchen outfits. At the moment a height of 3 ft. 1 in. is being aimed at.

Another important move towards standardisation is represented by the new No. 438 "Magnet." It is designed to standardise the small cooker business with one model only with a larger oven capacity than the usual "small" hiring-scheme cooker. The installation of the small cooker is usually dictated by the hiring charge, but the inability of the equipment to meet the extra demands when, say, friends are entertained, sometimes prejudices the housewife against electric cooking or involves changing to a larger size. The new cooker, then, comes between the small and medium sizes, although the oven is practically the same size as that of the medium cooker.

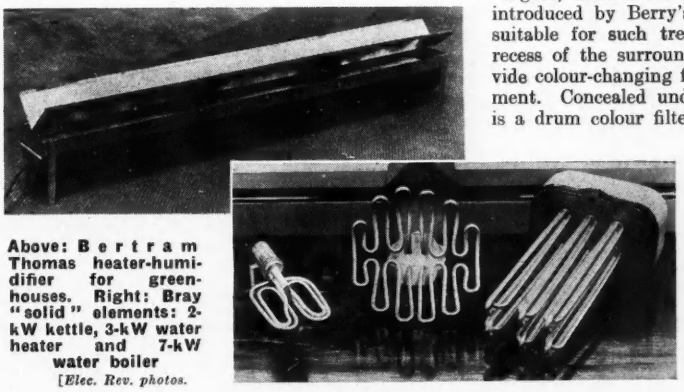
The G.E.C. feels that supply engineers will be interested and if they can get a reasonable programme they will be able to produce it at the same price as the "small" cooker, *i.e.*, No. 334. To sum up, the aim is to provide a cooker which will permit hiring out at the price of the "small" one, but with an oven capacity of 2,000 cu. in.

A Double-oven Model

The greatest measure of oven elasticity that we have seen is that in the new horizontal cooker of Belling & Co., Ltd. There is a large oven measuring 16 in. by 15 in. by 14 in. and a smaller, but not small, one measuring 10 in. by 15 in. by 14 in. When the cooker was introduced at Brighton last year the smaller oven was just a single-heat warming cupboard, but at the suggestion of several supply engineers it has now been given full oven heating with three-heat control. The larger oven has automatic control.

If the revival of an old idea can be revolutionary then that is the word for the oven of the new sheet-steel cooker introduced by Rubery, Owen & Co., Ltd. It is roughly a horizontal cylinder in shape and the element is wound round and distributed over the whole of the cylinder. But, the oven loading is only 1,250 W, and easy transmission of heat was the explanation given in support of the claims for high efficiency. The oven heats up to 500 deg. F. in 15 minutes.

The tendency of the past two years for the radiant hotplate to get an increasingly firmer hold continues. But we certainly cannot detect any decline of the solid plate. As Mr. Cartledge (Revo) said, many supply men are wedded to the solid plate for life. G.E.C. still have faith in the solid plate, but there is the radiant unit for those who persist in using the cheaper type of utensils said Mr. Nilson. There is the psychological effect aspect too, but the experience of Mr. Clarkson in South Africa is worth quoting. Coloured native cooks with previous experience only with wood fires, were not in the least perturbed at the absence of glow with the solid plate.



Above: Bertram Thomas heater-humidifier for greenhouses. Right: Bray "solid" elements: 2-kW kettle, 3-kW water heater and 7-kW water boiler
[Elec. Rev. photos.

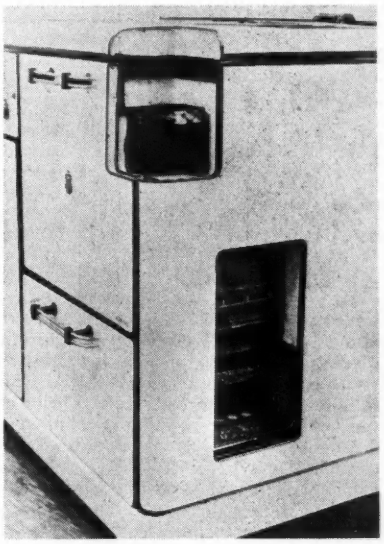
Revo have a new radiant plate which is made in two models —four-heat with three sections and three-heat with two sections. The loading is about 1,800 W and the diameter 8 in.

In these days of high loadings it was almost startling to hear Mr. Edinborough of Rubery, Owen talk of a 1,450-W *rapid* boiling plate. The explanation is the greatly increased surface area of the corrugated plate cover in conjunction with which are used special utensils with corrugated bottoms which fit the plate cover. The embedded tubes of the plate nest in the corrugations of the cover.

Two cooker novelties with marked utility value, we should say, are the cooking cabinet with a reflector fire incorporated under the oven as a built-in kitchen warming unit, and the table cooker with an heat-insulated base to enable it to stand on a refrigerator, both by the Jackson Stove Co., Ltd.

Fire and Heater Design

The reflector fire is obviously getting a better hold, not that there are noticeably more models, maybe there are fewer, but there is increased stability. For one thing there is a distinct move towards extending the "wings" of the wide trough units. The "Volcano" of W. T. French & Son, Ltd., is a good example of this and the parabolic feature remains undisturbed. The "Flamingo" of Bratt Colbran, Ltd., has a bottom lip extension of, say, five inches. Mr. Masterman suggested a relationship between the depth of the reflector-element if you like—and the amount of heat projected.



Air circulation arrangements in a new Moffat cooker
[Elec. Rev. photo.

But we think there is an unusual appeal in the multi-reflector fire with wide, as against narrow, troughs. The "Abbey" (Hotpoint) has two wide-angle reflectors, horizontally disposed but in tier formation.

The English Electric Co. mentioned the movement towards the reflector fire because of the big appeal of *projected* heat. The more easily replaceable rod element in clip contacts, as compared with the bar element of the non-reflector fire, also contributes towards this "pull."

There appears to have been a check in the movement to introduce all manner of glow effects—floodlighting, and so on—to all sorts and sizes of fires, but at the same time we detect a tendency to give special attention in this way to equipment usually of the more expensive type, in which the glow-effect is a fundamental feature of the design, rather than an appendage. In the equipment shown by Bratt, Colbran, for example, there is the central fire in a deeply recessed and fluted surround, a mantel and an overmirror built as one unit. Concealed flame-coloured lamps at the top of the surround "splash" the flutings at the corners in a manner which must appeal to the most unimpressionable.

Again, there is the new "Camellia" surround introduced by Berry's Electric, Ltd. Any fire suitable for such treatment can stand in the recess of the surround and the idea is to provide colour-changing floodlighting for the equipment. Concealed under the mantel at the top is a drum colour filter with six colour screens. It is motor driven very slowly and it can be made stationary at will to give just one constant colour.

There seems to be a revival of the more expensive type of fire after the lull of the depression years. To illustrate this point we cannot do better than refer to Berry's "Chippendale," a real old favourite, with its side dogs. We have seen it in solid brass and with its new "Magicoal Plus" dress it, as ever, expresses dignity, luxury and stability. The really all-mirror (including the skirting) mantel equipment of Bratt Colbran, with its deep reflector fire, falls into the "luxury" class of equipment, but it expresses modernity against the period design.

We are not prepared to say that the sheet-metal fire is on the decline or even at its height of development, but quite definitely those who said it would oust the cast fire were false prophets. The all-cast fires of Whyte & Collins (newcomers in the electric fire world) are not only evidence in support of this contention but they also show that the lower priced fire is not limited to the sheet-metal field.

The ordinary resistor element has long since won a place in electro-therapy by providing infra-red rays in conjunction with ultra-violet. It is a little confusing at first though to see in the "Sunlamp" of L. G. Hawkins & Co., Ltd., a non-reflector bar-type unit within the bowl reflector of the carbon ultra-violet ray equipment.

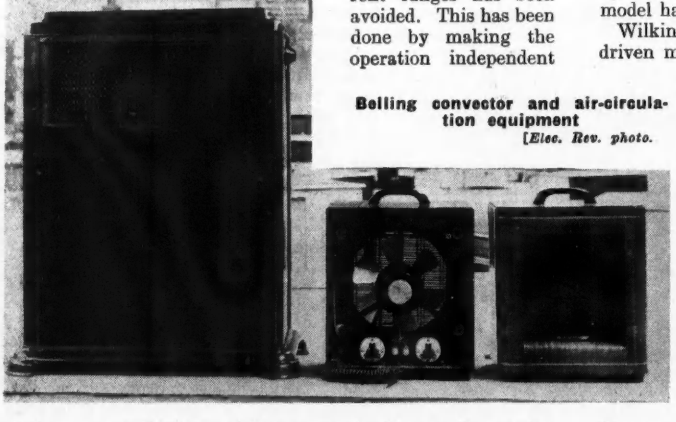
Hawkins "Sunlight" treatment lamp with non-reflector heating element
[Elec. Rev. photo.

With the present spate of convector equipment, ideas appear to be very mixed over the question of low-temperature heating. Some manufacturers use the term low-temperature in relation to the element, some in relation to the air at the convector exit and some to the general heating effect in the room. Shall we see two classes of convectors soon—high and low temperature? That would probably help to overcome what, at the moment, seems an inevitable difficulty. And a serious one too, because in spite of the apparently ever-growing field for the electric fire low-temperature heating is definitely gaining ground.

An outstanding advantage is, of course, the ease of automatic control. Perhaps Bulpitt & Co., Ltd., have found the happy medium between the two schools of thought regarding loading by supplying the two heats—1,000 W and 500 W—in the same model. Of course, the adjustable thermostat of some makes arrives at the same end. British Thermostat see definite signs of keenness on the part of manufacturers and users to accept automatic control for convectors and low-temperature equipment. And a need for the greatest care lies in the fact that the convector is particularly amenable to automatic control.

Mr. Williams of the Rheostatic Co., Ltd., threw some light on this rather perplexing question. He said it is better to switch on and off reasonably frequently because of the disadvantages pertaining to having heaters off for a long time and thereby losing radiant heat as well as possibly creating air flow reversals by down draughts. That, of course, appears to apply more to non-convector equipment, but it stresses the need for sensitivity in the thermostat.

The company has always made use of the current in the "stat" to aid sensitivity. Hitherto it has been necessary to market the thermostat with varying current ranges, say, 0-5 A and 5-15 A, to ensure that the assistance from the current flowing was neither too great nor too little. The principle has now been advanced a stage further so that still greater sensitivity is obtained, but in such a manner that the disadvantages of current ranges has been avoided. This has been done by making the operation independent of the current flowing, so that a standard room thermostat for a maximum of 15 A can be used for very small currents.



Belling convector and air-circulation equipment
[Elec. Rev. photo.

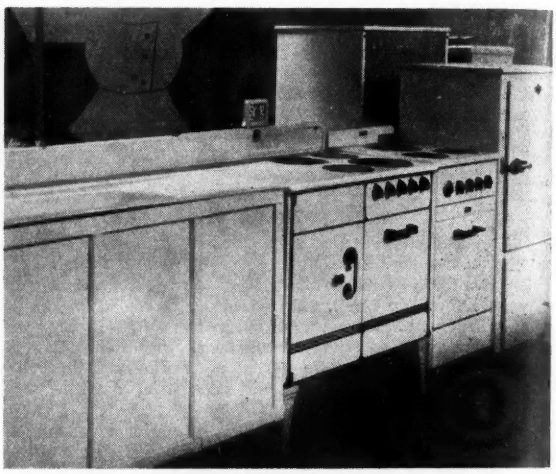
The whole issue is now further complicated by the introduction of fan heaters and air circulators. We think the suggestion that these should be termed forced-air circulators is a good one in that the term would help to provide a better distinction by comparison with convectors. Belling & Co., Ltd., think the forced-draught method is the domestic heating of the future. It is not new to the factory, of course, but in this connection it is said that it provides conveniently that "crude" form of heating so essential for the factory with extremely varying heat losses and uncontrollable air flows.

There, we think, the question is bound up with loading. An industrial unit exhibited by the British Trane Co., Ltd., has an aperture 15 in. square and a loading of 20 kW. The G.E.C. domestic fan heater is loaded at 1,200 W and has an aperture of 7 in. diameter. The 1.5-kW and 2-kW Belling air circulators measure overall 11¼ in. by 13⅝ in. by 6¾ in. and 16¾ in. by 17⅜ in. by 8⅜ in. respectively. The G.E.C. stresses the greater diffusion of heat permitted by the forced circulation and Mr. Curry (Belling) points to the importance of carefully directing the air current (to the room corners, for instance) to overcome possible objections to the greater air speed.

Revo told us that they are building up quite a flourishing low-temperature heating department and Carron said that in the near future they are going to make a concentrated effort with tubular heaters. The greenhouse heater introduced by Bertram Thomas seems to have partial claims to being domestic, low-temperature and air conditioning equipment. Over a V-shape body which contains a 120-W per foot element is a tray to carry water, and above the tray is another V unit which is designed to diffuse the humidified heated air.

Laundry Equipment

It is now evident that much business awaits the decision on whether there is a right and wrong between the electrically heated hand-agitated and motor-driven washing machines, or whether there is a field for both. At the moment the relevant ideas are very much in opposition. Burco, Ltd., support the suggestion that with boiling agitation in the full sense is unnecessary. All that is required said Mr. Coxon is occasional movement of the clothes to remove air pockets and assist water penetration. This, of course, is the object of the hand-operated paddle introduced by the company last year. A new model has a much larger wooden table (2 ft. × 2 ft. 6 in.).



[Elec. Rev. photo.
The Orme Evans "unit" kitchen equipment

Wilkins & Mitchell, Ltd., regard the heater of the power-driven machine as a handicap on the score of time spent in heating up the water. After all, said their representative, time saving is an idea behind the development of the electrically driven washing machine. The English Electric Co. says that those who can afford to buy power-driven washing machine nearly all have a hot-water supply system of some sort. British Electric Domestid Appliances, Ltd., will fit heaters to their machines, if required, but they reported little or no call for such fitments. The low-loading idea seems to have received very little support. The new motor-operated machine shown by Cotto Products has a "Monometal" container about 18 in. cube.

Ideas as to the best type of motion are as varied as ever. Jiffy Automatic Clothes Washer Co., Ltd., favour suction, and a model we inspected has 20 suction tubes round the rectangular container. Plungers at the top of a tube work up and down with the water agitation (by hand) and their action, combined with the peculiar design of the tubes and the paddle creates the suction. In endeavouring in a new wash boiler to give greater stability to the legs and their fixings Burco have also improved considerably the fixing of the switches and the cable gland.

The fixing part of the legs is extended half-way up the casing and in one leg is incorporated the switches and in another the gland.

The wash boiler and the sink have a particularly close relationship and we think, therefore, that Jacksons have scored a point in their sink model wash boiler. The aluminium lip at the boiler top overlaps the side of the sink so that all surplus water either runs into the sink or back into the boiler.

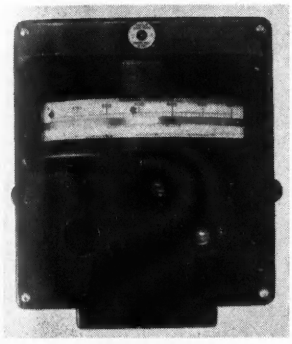
The few new water heater developments can hardly be said to be representative of the general trend. Various improvements to Berry's "Bellberry" include a larger apparatus plate (now cast-iron), two cable entries and a new inlet valve with a variable restrictor and non return. The new Berry circulator has a hole in the centre of the cover to permit adjustment without unsealing the cover. Does the new side entry circulator of the Simplex Electric Co., Ltd., represent another north to south trend from the usage point of view? Hitherto this type of circulator seems to have been confined to the copper cylinders found particularly in, say, Glasgow.

Notable developments of the embedded solid tubular elements are the "Tubalox" of Geo. Bray & Co., Ltd. The main ideas behind this development are quicker heat transfer, greater loading and, in particular, perhaps, flexibility in their manufacture to the shape and size. The 7-kW water boiler unit, the 3-kW bowl-shaped element for the bottom of a dome cylinder and the 2-kW kettle unit measuring 4½ in.×5 in. clearly emphasise the flexibility referred to. A new safety kettle element introduced by Bulpitts has the safety device at the centre of the loop instead of at the head, and a new principle is the cog-wheel, holding the release bar, locked in a special melting alloy.

Lan-Bar, Ltd., are finding a profitable development field in connection with self-contained electrically heated towel rails. In numbers they would provide a useful summer load when the ordinary towel warmer is not served, and their low load, 30 W per foot, encourages constant use.

A Variety of Industrial Equipment

FURNACES of one kind or another continue to be prominent at the Fair, and even non-electrical types need motor-driven blowers and electrical control panels, as well as pyrometric outfits. For instance, the "Indicorder" offered by Ether, Ltd., for furnace control operates in conjunction with contactor-actuated motor- or solenoid-driven valves and air dampers. This combined



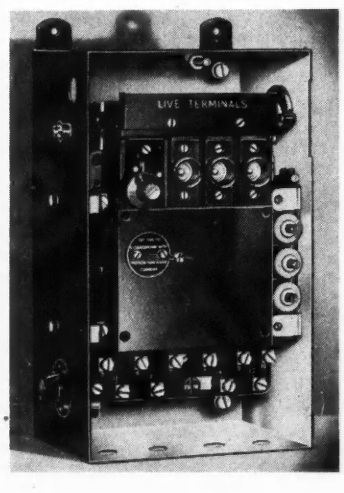
The Ether furnace temperature controller

indicator and recorder can be made on the thermo-electric, potentiometric, or resistance methods, according to the range of temperature and nature of the duty to be performed.

The instrument is of the make-and-break pattern, a pointer driven by a small synchronous motor being lifted at intervals in relation to two plates which determine whether the mercury switch is to be left in the "on" or "off" position. A movement of the pointer of 0.008 in., equivalent to 2 deg. C. at a working temperature of 800 deg. C., is sufficient to cause the switching mechanism to function.

The Rheostatic Co., Ltd., has a new control box for coal stokers of central-heating plant. It combines two functions, since it contains a main switch, fuses, and motor-starting relay as well as timing apparatus. The latter, in conjunction with boiler and room thermostats, not only maintains combustion at the rate necessary to provide the total heat requirements, but also serves to just keep the fire alight at night and during week-ends when there is no general demand for heat.

Wild-Barfield Electric Furnaces, Ltd., are now producing a rectangular Model HM2 of unusual external appearance. Actually it is one of the "Hairpin Minor" type, but larger high-temperature furnaces for hardening high-speed steel tools are constructed in somewhat similar fashion. The "counter-scale curtain" method of controlling the interior atmosphere prevents the entry of air into the furnace chamber, the door being fitted with special seals to render it gas tight. The control valves and flowmeters for injecting gas and air are mounted flush on either side of the door at the front. The door is opened electrically by means of a push button. Push knobs also enable additional quantities



The Rheostatic Co.'s stoker control box

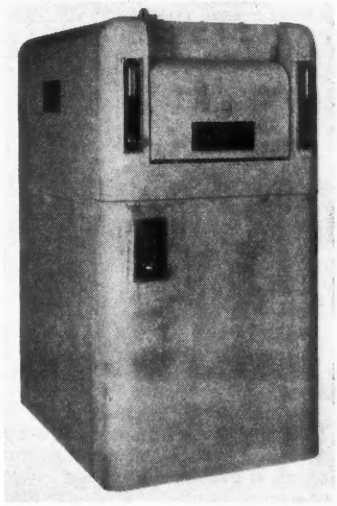
of gas and air to be admitted when the door is open.

New Motors

Higgs Motors, Ltd., are showing for the first time a range of new-type fan-cooled a.c. motors, both squirrel-cage and slip-ring, which have been developed for non-standard applications. The component parts are mostly identical with those of standard ventilated machines. Thus their cost of production is low and they are small in relation to their outputs, being in fact very slightly larger than equivalent ventilated designs, so that they may more easily be mounted direct on to machine tools and other classes of machinery.

The motor is totally enclosed and mounted in an exterior shell which forms a duct for the cooling air from a fan driven by, and mounted on, the motor shaft. The end cover is contoured to assist the easy flow of air, and the fan is of the centrifugal type; air is drawn in through the centre of the cowling, which has an ornamental fretwork cast in, with large openings that do not get clogged up in service. For the same reason the double shell passages are large to eliminate fins, cooling ribs, or other obstructions to the free passage of air.

The General Electric Co., Ltd., has recently developed a



Wild-Barfield tool-hardening furnace with electrically operated door and controlled atmosphere

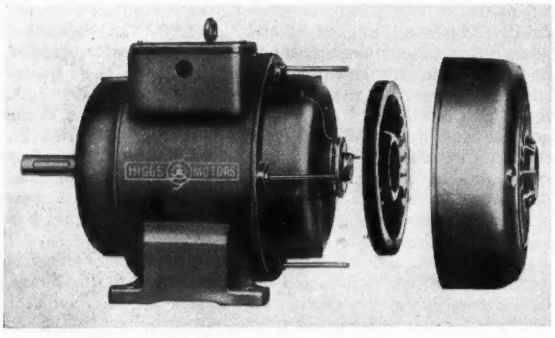
range of steel works motors of from 5 to 200 h.p., d.c. with compound, shunt, or series field windings as desired. The low armature inertia permits quick starting, stopping, and reversing, and, at the same time, minimises current peaks and energy consumption. Maximum starting torque is ensured by so rating the shunt field that it can be left permanently connected to the supply irrespective of whether the motor is running or not.

Dynamic braking is employed, and large air gaps are provided, while no cast iron is used. The cast-steel magnet frame is split, and all but the larger sizes are hinged, so that in all cases the armature can be lifted vertically from the shell. Roller cartridge bearings are fitted.

Tank Vehicle

On the stand of Associated Electric Vehicle Manufacturers, Ltd., is one of several tanks built for the R.A.F. by Electricars, Ltd., for refuelling aeroplanes. By employing a battery-driven vehicle the fire risk is reduced. In front is a tank to contain 15 gallons of lubricating oil, and at the rear is a flat tank accommodating 300 gallons of petrol. A single motor drives two pumps, one at each end of its shaft. A free-wheel device is added so that when the motor revolves in one direction petrol is pumped into the aircraft, while in reverse oil is pumped.

This 25-cwt. vehicle is propelled by a single motor with the usual contactor controller and tiller steering from a platform at the front, with a "dead man's" pedal which interlocks the main switch and brake. Pneumatic tyres are fitted, and the Young accumulator of 15 cells for 30 V is housed in a metal box on top of the petrol tank, so arranged that the cells can be lifted out in their crate.



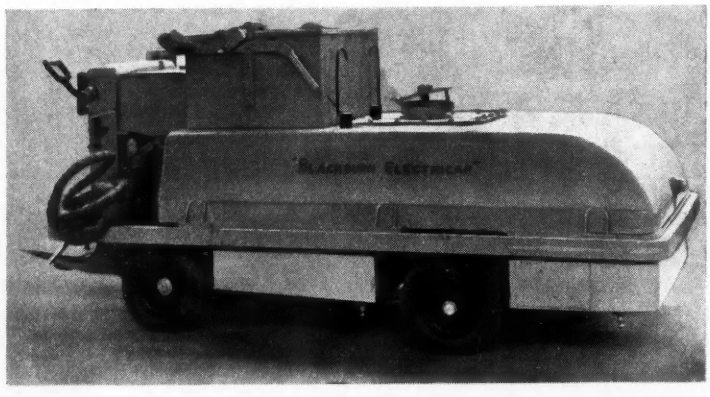
New Higgs fan-cooled motor

The Donovan Electrical Co., Ltd., has devised "Runtact" power ducts for overhead suspension in workshops and factories to act as feeders for portable tools of normal or high frequencies. They are supplied in rigid 8-ft. lengths, open at the bottom and made of sheet steel. The horizontal inturned edges of the vertical sides of the duct serve as a track on which light alloy brush carriages run on easily replaceable pressed-steel cup-and-cone ball-bearing wheels. The carriage thus follows the movement of the pendant tool about the shop assembly lines.

Welded-steel couplings secure the duct sections together, end to end, and are specially designed to maintain alignment of the interior track. Brass collector brushes fitted in insulated boxes on the travelling carriage make contact with continuous flat busbars attached by insulating supports within the duct, at the top.

The standard capacity is 200 A at up to 250 V, single and three phase. Flexible tails couple the carriage brushes to three fuses, the other terminals of which go to a 5-A triple-pole quick-make-and-break switch arranged for cord operation from the ground. Beneath the brush carriage are a split cable grip and rubber reinforcing sleeve for securing the flexible connector descending to the portable tool, which is made detachable by a plug and socket connector in the flexible cable.

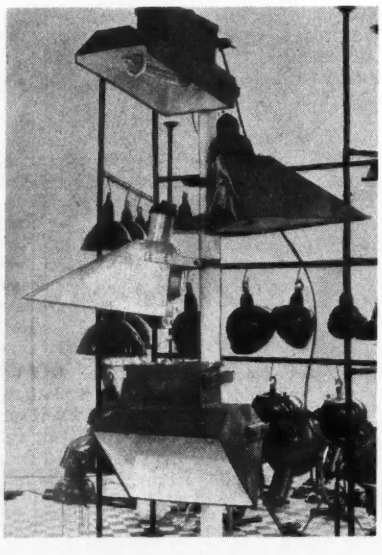
Another item is a new-type earthing switch with a trapped key in the lid, which can only be removed when the switch is earthed.



An aeroplane refuelling electric vehicle [*Elec. Rev. photo.*

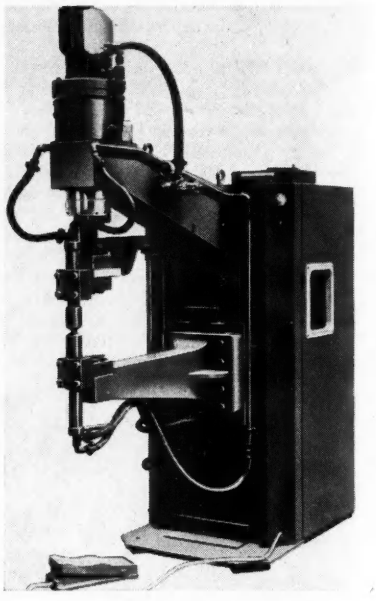
Lighting Devices

Among a variety of lamps for use in mines and inflammable atmospheres shown by the Concordia Electric Safety Lamp Co., Ltd., is an anti-explosive dry-battery torch. The metal case is a solid-drawn copper tube, and the reflector and lamp bulb are behind an "armour plate" lens, which is further protected by a metal grid specially designed to minimise shadows. The screw-type switch works in a long flame-proof bush, and a locking device prevents unauthorised tampering with the cover glass.



Rowlands discharge-lamp fittings [*Elec. Rev. photo.*

Rowlands Electrical Accessories, Ltd., are now offering sodium lamp floodlights for overhead mounting or upward projection with the necessary chokes and control gear all contained within a weatherproof housing attached to the top or underside of the reflector fitting. This simplifies erection, and, while these fittings are made for 150-W lamps, they can easily be adapted to accommodate 100-W lamps. They are fabricated from heavy-gauge steel, vitreous enamelled white inside and grey outside.

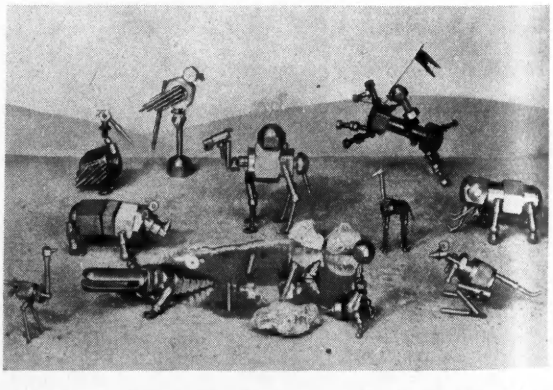


A 180-kVA spot welding machine shown by Philips Industrial

Varied types of "Realite" shop-window fittings are available for users who prefer their light to be colour corrected. This is achieved by combining within the mirror reflector housing both filament lamps and mercury-vapour bulbs. Also Rowlands pressed-steel bulkhead and watertight fittings are only half the weight of cast models, and there is no risk of cracking when screwing them to an uneven wall.

Improved Philips Industrial welding equipment includes a 180-kVA "Tempomat" outfit for automatic control with the aid of valves on the saturated transformer principle. A range of from 1 to 25 cycles is provided, which enables spot welding to be closely controlled so that it is actually possible for a continuous seam to be formed.

A large selection of rectifiers is available for welding thin sheet metals. For such purposes a rectified current is very desirable, because it provides a quick recovery voltage (of the order of 0.0002 second), otherwise the arc tends to be extinguished, or if the current surge is too large it will burn through. Such quick recovery is not possible with rotary machines, due to magnetic lag. In rectifiers it is obtainable through the agency of the electron stream, while efficiencies



A curious zoological collection shown by C.L. & Repetition, Ltd.

equivalent to that of a transformer are ensured with direct current, in this way avoiding the usual rotary conversion losses.

The Philips mains-operated, wide-range measuring bridge warrants special attention. Being of the electronic type, it avoids parallax errors, is quite inertialess, and not affected by vibration. The high accuracy is unaffected by mains voltage fluctuations. Both resistance and capacity measurements may be read directly from the scale of the instrument, while inductance measurements are made by using external standards.

The industrial side of the General Electric Co.'s stand at Birmingham

The balance indicator consists of an electron beam working in conjunction with a high-gain pentode valve amplifier, the degree of sensitivity being continuously variable by a potentiometer. The instrument is housed in a metal case of quite small dimensions and is equally suitable for laboratory or general uses. No damage can be done by short-circuiting the terminals, since the a.c. voltage between them is only 1 volt. An effective way of revealing vibration is demonstrated by means of two crystal-mounted needle points, which are placed on the surface to be gauged, and are arranged to transmit impulses resulting from vertical and horizontal vibration to a cathode-ray oscillograph with which is combined an amplifier having a flat characteristic over an unusually wide range.

New Books

Light, Photometry and Illuminating Engineering. By W. E. BARROWS. Second Edition. Pp. 445; illus. London: McGraw-Hill Publishing Co., Ltd. Price 24s.

This is the second edition of a book which, since its first first publication in 1925, has been recognised both in this country and in America as a thoroughly reliable and well-written textbook for students of illuminating engineering. The amount of revision rendered necessary by the development of new illuminants and by progress in the technique of illumination has been very extensive, in fact the author says in his preface that two-thirds of the material is new.

Of the fourteen chapters one, the first, is devoted to a review of the phenomena of radiation and the more important aspects of vision, four deal with photometry, while in the remaining nine the author treats the subject of illuminating engineering both generally and in its application to particular lighting problems.

In view of the wide scope of the book it is, perhaps, surprising to find descriptions of so many different types of photometers, and if some of this material had been omitted it might have been possible to include a more adequate treatment of the practical use of the integrating sphere. For students in this country the chapter on portable photometers has the, perhaps inevitable, disadvantage that the instruments described are all American. This applies to both the visual and the photo-electric types.

Apart from these criticisms, however, the book can be thoroughly recommended for use by those requiring a well balanced and reliable treatise on modern illuminating engineering, both theoretical and practical. The style is clear, there is no lack of diagrams or photographs and the publishers have adequately performed their part in the production of a book which forms a valuable addition to the literature of illuminating engineering.

Electrical Measurements. By F. A. LAWS. Pp. 739; figs. 476. London: McGraw-Hill Publishing Co., Ltd. Price 36s.

This revised edition of the late Prof. Laws's book will be a welcome addition to the growing literature on the theory and technique of modern electrical measurements. The book will, by the amplitude of its treatment, be of great value as a work of reference to the specialist, and the clarity and completeness of the theory of electrical measurements will render it acceptable to the student. The mathematics, although generally simple, reach a fairly difficult standard in parts.

The range of the book includes the whole scope of laboratory measurements of current, voltage, resistance, inductance, and capacitance. There are valuable and comprehensive chapters on power measurements in a.c. circuits, electricity meters and demand indicators, graphic instruments, and instrument transformers. The sections on phase-measuring instruments, reactive and kVA measurement, and on symmetrical component measurements, although somewhat brief, are good. There is an excellent practical chapter on the calibration of instruments, while further information of this kind will be found in the chapter on meters.

The book concludes with two useful chapters on the determination of wave-form and on cable testing and fault localisation. The subject of wave analysis is illustrated by a fully worked numerical example. The book is copiously illustrated by excellent line diagrams, it is provided with a good index, and attached to each chapter is a full list of references to other relevant works and original papers. In spite of a considerable amount of matter on meters, cable testing, and instrument transformers, the general bias of the work is in the direction of laboratory practice. We consider that the utility of the book from the theoretical standpoint would have been improved by an introductory chapter dealing with units.

Reports on Progress in Physics. Vol. IV. Edited by A. FERGUSON. (Pp. 389.) London: Physical Society. Price 20s.

The appearance of the fourth volume of this valuable annual conspectus of progress achieved in the main divisions of physical science reminds us that they are tending to become less strictly confined to recent advances. When justified, immediately prior developments are covered concisely in order to present the specialist with an ordered story and at the same time afford a sort of preface for the trained physicist who is not a specialist. In some instances the reports are intended wholly for the non-specialist. Vol. IV includes a section on electrolytes and electrolysis, and another on experimental electricity and magnetism, which treats of such things as the breakdown of insulating materials (electric strength), frictional electricity, the measurement of current at radio frequencies and the effects of electrical oscillations on biological materials.

Magnetism. (Pp. 102; figs. 47.) London: The Institute of Physics. Price 4s. 6d.

This reproduction of six lectures delivered at the summer conference of the Institute at Manchester is an expert summary eliminating the trivial from the broad trend of modern thought, without being confused by masses of technical detail. Last year's conference differed from previous ones in that for half the time industrial scientists talked to university representatives, so helping to strengthen the links between teaching and practice, which is the object of these annual gatherings. The magnetic properties of materials have been improved extraordinarily, almost entirely by empirical methods. Theory has advanced too, but the guidance it is likely to provide must depend upon academic appreciation of industrial requirements.

Shorter Notices

"Air Conditioning in Summer and Winter," by R. E. Holmes. (Pp. 296; figs. 118.) Price 18s. "Physics for Technical Students in Colleges and Universities," by W. B. Anderson. (Pp. 807; figs. 534.) Price 24s. "Fundamentals of Radio," by F. E. Terman. (Pp. 458; figs. 278.) Price 21s. London: McGraw-Hill Publishing Co., Ltd.

"Radio Upkeep and Repairs for Amateurs," by A. T. Witts (pp. 196; figs. 112), price 5s.; and "Radio Receiver Circuits Handbook," by E. M. Squire (pp. 88; figs. 43), price 4s. 6d. London: Sir Isaac Pitman & Sons, Ltd.

"Trockengleichenrichter," by K. Maier. (Pp. 313; figs. 313.) Price Rm.18. Munich: Verlag Oldenburg.

"Electricity and Magnetism," by H. G. Lambert and P. E. Andrews. (Pp. 204; figs. 150.) Price 2s. 3d. London: University Tutorial Press.

"Handbook of Chemistry and Physics." Edited by C. D. Hodgman. (Pp. 2,069.) Chemical Rubber Publishing Co., Cleveland, Ohio; price $6.50.

Electrofilters for Gases

Examples in power stations and industrial works

SOME applications of electrostatic precipitation to the cleansing of industrial gases are outlined in a paper by Dr. H. J. Bush read at the Institution of Chemical Engineers in London on February 18th.

The author states that mechanical separators (cyclones) cannot be expected to collect dust finer than about 20 microns with any reasonable degree of efficiency. Elutriator tests of dust caught in a Lodge-Cottrell electrofilter at a power station burning pulverised coal showed that 94 per cent. of the dust caught was composed of particles smaller than 20 microns, 20 per cent. was between 20 and 10 microns, 65 per cent. was between 10 and 5 microns, and 10 per cent. was smaller than 5 microns (one micron is 0.001 mm.). It is usual to guarantee for power stations a recovery of from 90 to 95 per cent. of all suspended matter in the flue effluent gases. A greater degree can be achieved for a larger capital outlay.

Various types of collecting electrodes and associated high-voltage rectifiers are briefly described, while reference is made to some of the large number of plants that have been put to work in this country during the past five years. The author states that it is unlikely that any new cement works will be designed without provision for dust separation by electrical precipitation. In America electrofilters have been a standard component of cement works for many years past, and Europe followed suit soon afterwards.

The author describes a number of electrostatic precipitation systems operating in this country and abroad

The largest electrical precipitator installed in any power station in this country is in operation at the Hams Hall generating station at Birmingham, handling the flue gases from eight pulverised fuel-fired boilers. It is of the rod-curtain type, and consists of eight independent units, each with inlet and outlet shut-off dampers. The shells are of reinforced concrete construction. Each of the eight units is provided with four banks of electrodes in series. The precipitated dust falls into hoppers below each section of the plant, and is thence discharged through a rotary dust valve into a sluice. The dust is carried away to a thickening plant, filtered and dumped.

At maximum boiler output the total volume of gas passing into the dust precipitator amounts to 880,000 cu. ft. of flue gas per min. at a temperature of about 310 deg. F. The dust content of the cleaned gases leaving the precipitator is remarkably low, namely, 0.10 grain of dust per cu. ft., and is of extremely small particle size. Hardly anything is over 10 microns, the bulk of the dust being about 5 microns, while a large proportion is below 3 microns. Up to 100 tons of dust per day is separated by this precipitator. The power consumption is 0.6 kWh. per 100,000 cu. ft. cleaned.

Besides this installation, electrofilters are installed at the power stations of Nechells, Willesden, Brimsdown, Leicester, Leeds, Nottingham, Derby, Battersea and Horden Collieries, using partly the plate-type electrode and partly pipes. In the U.S.A. there are numerous plants using either the rod-curtain electrode or the graded-resistance concrete plates. They have also been installed on the Continent, in South Africa, India, Australia, and in Japan.

Unburned Carbon

There is a large difference in the contents of unburned carbon of the fly-ash caught; whereas at a station near London the percentage was less than 1 per cent., in others it is as high as 40 per cent. This unburned carbon has a marked influence on the behaviour of waste gases in electrical fields.

Fly-ash collected in the electrofilter at a power station in Belgium is blown back into the combustion chamber and subsequently recovered in the form of a sintered material which is sold for road making. The unburned carbon, varying from 10 to 20 per cent., is largely consumed, resulting, so it is claimed, in an increase of 1½ per cent. in boiler efficiency.

Probably the largest electrofilter installation for dealing with combustion gases is the one at the Leuna Werke. The gas volume dealt with is 2,300,000 cu. ft. per min., and enough dust is collected in 24 hours to fill fifteen 10-ton railway trucks. Very large volumes are also encountered in the waste gases from furnaces drying the lignite before it is burned. The material is exceedingly dusty, and special precautions have to be taken to avoid explosions in the electrical field that might be occasioned by a chance spark-over.

Electrical precipitation is particularly suitable for the recovery of fumes from metallurgical operations, for practically no back pressure is exerted to upset correct furnace conditions or necessitate a powerful fan. The gases can be treated at a temperature sufficiently high to avoid corrosion danger, and the valuable dust is recovered in a dry state ready for immediate further treatment. Many installations of this type are at work in this country and abroad, and, with the experience gained over a long period of years, recovery efficiencies of 98 per cent. can be guaranteed, while actual recoveries up to virtually 100 per cent. are realised.

The following is a partial list of some of the substances which are being recovered by electrofilters: alumina from rotary calcining kilns, arsenic from roasting gold concentrates, tin, copper, lead, silver and antimony from smelting operations, gold chloride from the refining of bullion, nickel oxide from calcining furnaces, barium sulphate, lead sulphate, and zinc oxide.

Records of development on the Continent show that a few years ago there were 368 electrofilter installations dealing with over 91 million cu. ft. of smelter gases an hour and recovering 100,000 tons of dust a year. Such figures indicate the importance of the role this art is playing to-day in industry.

There are two methods of cleaning and removing water from blast furnace gas for subsequent use in steel works furnaces. Either the hot, dirty gas is taken through a cooling tower suitably packed and irrigated with sufficient water to bring the gas temperature down to roughly 25 deg. C. and then the remaining dust and water particles are removed in suspension in a wet type of electrofilter; or the gas is first cooled in an empty water-sprayed tower to approximately 80 deg. C. and then passed through an electrofilter of the dry type where the greater part of the dust is precipitated. Then the gas is passed through a packed slat cooler to reduce its temperature to about 25 deg. C., and, lastly, the small traces of dust remaining, and particularly the entrained water particles and fog, are completely removed in a wet type of precipitator. The advantages of the "two-stage process" are that the make-up water is comparatively small, being approximately 50 gallons per 100,000 cu. ft. of gas cleaned, and temporary overloads of up to 25 per cent. do not raise the dust content of the clean gas.

The power consumption of the two-stage process is about 2 kWh for every 100,000 cu. ft. of gas cleaned, inclusive of the current required for the precipitating chambers, rapping gears chamber, dust conveyors, water pumps on pre-cooling tower and slat cooling tower, and water circulation. The single-stage wet process takes a little more power, up to 3 kWh, according to the equipment needed for dealing with the watery slurry.

Checking Performance

The best indication of the performance of the electrofilter when working down to these low limits is the colour of a pilot flame burning clean gas. If fine-cleaned to 5 or 6 milligrammes per cu. metre the flame is a perfectly clear pale blue, and immediately the dust content goes above this it shows a reddish-yellow tinge.

Coke-oven and town gas, even after scrubbing and cooling to 25-30 deg. C., still contain small quantities of tar in the form of fog, and there are few modern coke-oven plants that are not equipped with electrical detarrers in place of the older mechanical types. The tar is free-flowing and readily runs off the electrodes. Occasionally trouble has arisen through condensed naphthalene building up between the electrodes and causing arcing. This is remedied by steaming the plant at intervals. The high-voltage insulator leading into the precipitating chamber must be kept warm by steam-jacketing or electric heaters to prevent condensation on the surface. Efficiencies are usually from 96-99 per cent. and power consumption amounts to less than 1 kWh per 100,000 cu. ft. of clean gas.

Fused silica has proved useful for insulating the high-voltage equipment in the chamber, and consumption is of the order of 2 kWh per ton of ore roasted.

London Electrical Engineers

The annual prize-giving, concert and reunion of the London Electrical Engineers (Chelmsford Detachment) and its successor, the Essex Fortress Royal Engineers took place in the Drill Hall, Chelmsford, on February 12th. Lt.-Col. W. A. Vignoles, D.S.O., M.I.E.E., an Old Cromptonian, addressed the gathering as the first officer of the unit in Chelmsford, which he commenced to raise in 1896, and gave a message to his audience from Col. Crompton, who was the second commanding officer at the London headquarters. The present commanding officer, Major R. J. Leeds, R.E. (T.), also an Old Cromptonian, together with the C.R.E., Col. A. E. Q. Perkins, Alderman O. Thompson (Deputy Mayor of Chelmsford) and Capt. J. R. J. Macnamara, M.P., were the other speakers.

New Central London Showrooms

Up-to-date Regent Street premises

A GREAT variety of electrical apparatus ranging from complete air conditioning equipment to a combined clock and radio receiver is exhibited at the new West End showrooms of Central London Electricity, Ltd., in Regent Street, London, W.1. The decision to employ air conditioning should make the installation of interest to many people in this dense office and shop area.

A modernistic note is struck immediately upon entry by the tubular chromium plated chairs with red upholstery and the general modern architectural design of the showroom, an unusual feature of which is the spiral staircase supported only by a central vertical pole. Tubular lamps spell the company's name, large photo murals depict the progress of electricity, and a map photographed directly on to a translucent glass panel shows the area of the undertaking. These designs are illuminated by a battery of eight coloured flood lamps.

The Central London Showrooms, Regent Street

1. The exterior at night. 2. Part of the ground floor. 3. Another view of the ground floor. 4. Upper floor showing cashier's desk and "unit" kitchen *[Elec. Rev. photos.*

One exhibit of almost every type of electrical equipment is shown—including the new Jackson thermostatically controlled cooker and an electrically operated chicken roasting spit. Light sycamore wood panelling is employed, inlet panels bearing large photographs of equipment. There is also a special recessed panel of changing colours which appear like rising flames. While serving for decorative effect, these also draw the customer's attention to a recess in the main showroom which contains a radio demonstration theatre, part of which can be curtained off for television demonstrations, and numerous small appliances. This section is lighted by 18 kW of lay lighting.

Another section is devoted to lighting fittings. This includes a bank of switches operating direct, semi-direct, general, semi-indirect and indirect lighting fittings, the amount of light being recorded by a photometer giving watts per sq. ft. and also foot-candles. To supplement the actual fittings there is a series of thirty photographs on the wall while there is also an enlarged model of a coiled coil lamp as well as a model three-dimensional polar curve. The section also contains a display cabinet showing different types of lamps and their respective consumptions (also a 10-kW lamp) as well as four specimen types of diffusing glass—maximum daylight, cathedral, obscured and large morocco.

Before leaving the ground floor mention should also be made of a wall panel of anodised aluminium and a full range of refrigerators at the bottom of the stairs.

On the first floor are calculating machines, cookers and convector heaters. There is a particularly interesting unit kitchen outfit comprising cooker, refrigerator, sink, cupboards, a three-heat airing cupboard and an automatic electrically operated refuse destructor, the whole equipment being built up into one unit. Small model kitchens in wood are also shown.

The atmosphere of the building is fully air-conditioned with twelve changes of air per hour, two being from outside. Both floors have their individual thermostats, but a single humidistat serves for the whole building. About 70 kW of lighting is installed, in addition to domestic showroom appliances, many of which are intermittently used and are apt to present difficulties in temperature control. The air-conditioning plant provides cooling, filtration, humidification and heating, a 7½-h.p. motor being used for the compressor and a 4-h.p. motor for the fan. The heating equipment is loaded at 33 kW.

Underground there is also a 300-kW sub-station. Both this and the air-conditioning plant are designed for the inspection of the public.

The new showrooms were opened on Tuesday, the occasion being followed by a luncheon at Claridges, presided over by Lord Lytton, chairman of the company, who gave the loyal toast. A speech was made by Sir Cyril Hurcomb, chairman of the Electricity Commission, who agreed with Lord Lytton that the merger of the six London undertakings had resulted in considerable benefit to the consumers.

Among those present were Sir George Lee, president of the I.E.E.; Mr. S. B. Donkin, president of the Institution of Civil Engineers; Sir Archibald Page, chairman of the C.B.E.; and Messrs. J. M. Kennedy and C. G. Morley-New, Electricity Commissioners.

A.c. Meter Testing.

By A. M. Strickland, B.Sc., A.M.I.E.E.

Equipments that have proved sound in practice

IN the undertaking with which I am associated, the practice has been to carry out at least one dial test, in addition to revolution tests at not less than six loads to determine the meter error curve. These tests are made with the equipments described in an earlier article.* In general, the dial test is carried out at full load at unity power factor, and for some years has been used as a quite independent check on the results already obtained by the wattmeter and stop-watch methods.

A minimum requirement is that all meters shall run on full load for one hour and/or that at least ten complete revolutions of the last dial pointer shall be obtained. The standard set was that the resulting registration should agree within 1 per cent. with the appropriate error already obtained, and in addition must be within ±2 per cent. of accuracy. Occasional batches of meters are also run on fractional loads, sometimes in addition to the main load, as a means of securing information.

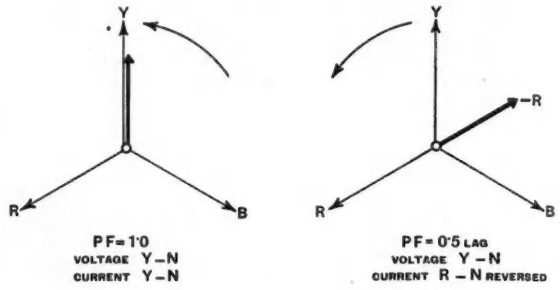
Portable meter racks pass from the fixed sub-standard tables used for determining the error curve to a special equipment built and reserved for dial testing. Since it became inconvenient to carry out the dial test by holding a constant load for a definite period, a method of running against a sub-standard meter was employed. Such a method is only considered feasible, however, if a sub-standard meter of high-grade accuracy is used. A specially designed induction type meter of this class has been used which has an extremely small variation in accuracy due to external temperature, self heating and voltage changes.

In addition, a second line sub-standard, which is a meter of more or less usual construction and characteristics, but carefully calibrated is also continuously acting as a check on the main sub-standard. The main sub-standard has the usual resetting pointers, and its successful use, without any possible ambiguity in readings and without any need for the tester in charge to stand by at the end of a run, involved the development of a device which could be relied upon to cut off the load at about 99 per cent. of the required kWh.

Possibly the ideal would have been some device photo-electrically operated from the actual main sub-standard, but that involved certain complications, and every endeavour was therefore made to press into service, with the minimum of alteration, such apparatus as was already available commercially and at low cost.

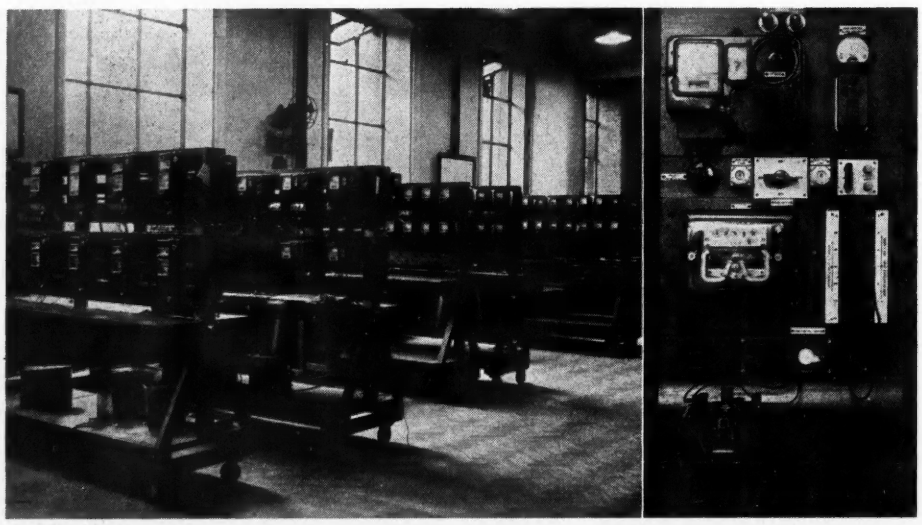
Three dial-test equipments, two of 5-A and one of 20-A capacity, were employed. Normally, for unity p.f. the low-voltage transformer is switched to the same Y to N phase as the meter voltage; with the reasonably large low voltage used, a considerable proportion of which was absorbed in a swamp resistance of about 6 ohms, the p.f. closely approaches unity.

The 20-A equipment employs a rotary tapping switch on the low-voltage side of the transformer, giving values up to 20 W, and has a main fixed swamp resistance. For a lagging p.f. provision is made on the main switch for placing the low-voltage transformer reversed primary on the R to N phase of the supply, when a p.f. of not less than 0.45 lagging is usually obtained with meters not having unusually high current-coil reactance.



Vectors for dial-test equipment

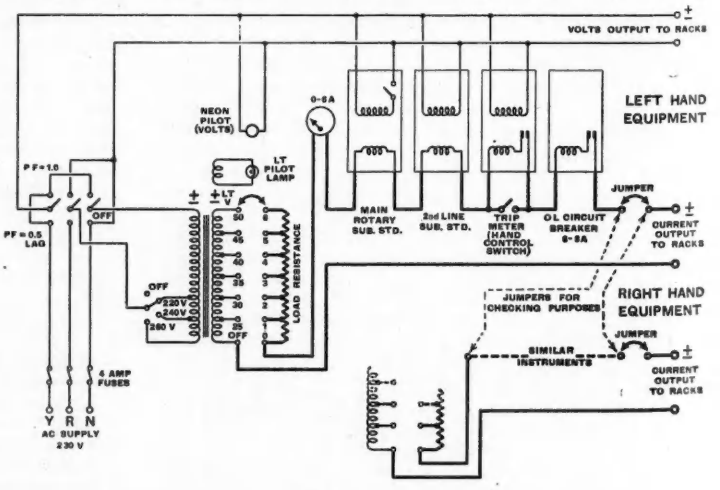
Facilities are provided for inter-connecting the sub-standard meters for periodical checking, apart from the periodical removal of all meters for checking by other equipment.



Portable meter racks and (right) 5-A dial-test equipment

For the smaller equipments a modification was made to the standard variable tariff type of prepayment meter with the object of obtaining a much larger movement of the credit pointer, which now covers 1 kWh for its complete travel. To obtain this a standard 1,800 r.p.u. meter had its train changed to one for 900 r.p.u., thus doubling the travel on this account. In addition, a further gear was introduced in the prepayment part so that a further ratio of three to one was obtained. Also, an operating knob was fitted in lieu of the variable setting device and coin gear.

A new scale was then fitted, and for particular accuracy at the 1-kWh and ½-kWh points adjustable index devices were set as required. These modified meters prove very successful if great care is taken in setting the pointer, and they



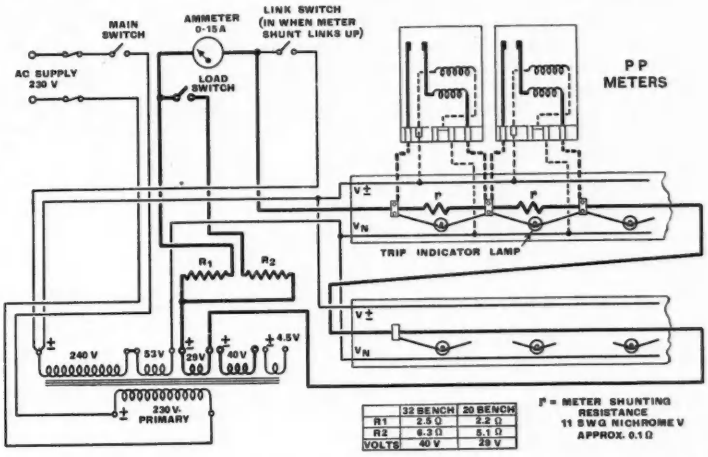
Circuit diagram for 5-A dial-tester

* ELECTRICAL REVIEW, February 11th, 1938.

have the advantage that the set-up may be reduced or cancelled and the switch tripped without difficulty.

On the larger equipment a standard 10-A prepayment meter has been used. The coin gear is removed and a press knob fitted to the operating plunger. The price-change unit is one giving a value of 5d. per kWh with a penny coin, and the credit pointer scale now gives 2 kWh for the first revolution and a total capacity of 10 kWh on the two scales. Thus, an extremely wide range of settings, from ½ kWh up to a total of 10 kWh by ½ths, is possible. To indicate at all times the condition of this trip-meter's switch a wire fixed to the switch arm traverses a closed-open marking on the upper dial.

Since this particular meter may be set for runs of 10 kWh, involving fifty pushes of the press knob, an additional knob on the left side operates on the declutching device fitted to the train of this type of meter, and a setting knob in front can engage and operate on the rate-change unit.



Connections for prepayment mechanism tests

In both cases, when the trip meter has operated, the run is completed by the tester operating a hand-control switch in lieu of the meter switch; this generally involves only a very short period of attention, any time after it is seen that the trip meter has operated.

On satisfactory completion of the dial tests the dial pointers of the meters are reset to zero, ready for issue, their covers are replaced finally, and an insulation test at 1,000 V, a.c., is taken both between coils and to case, and by "Megger." The rack is then removed to the connecting bay, where the meters are taken off and sealed ready for removal to the store.

Prepayment meters are tested, as regards their energy registration, on the system described, but previous to this they are given a fairly rigorous test on the coin and prepayment part only. For this, special coin test racks are provided. Each meter is shunted by a trip resistance of approximately 1/10th ohm, so that, when its switch opens, the series current continues to flow *via* the resistance. In addition, the drop across this is sufficient to light up a small bulb wired across it, thus showing which meters have tripped and require attention. Fixed ballast resistances keep the current within limits.

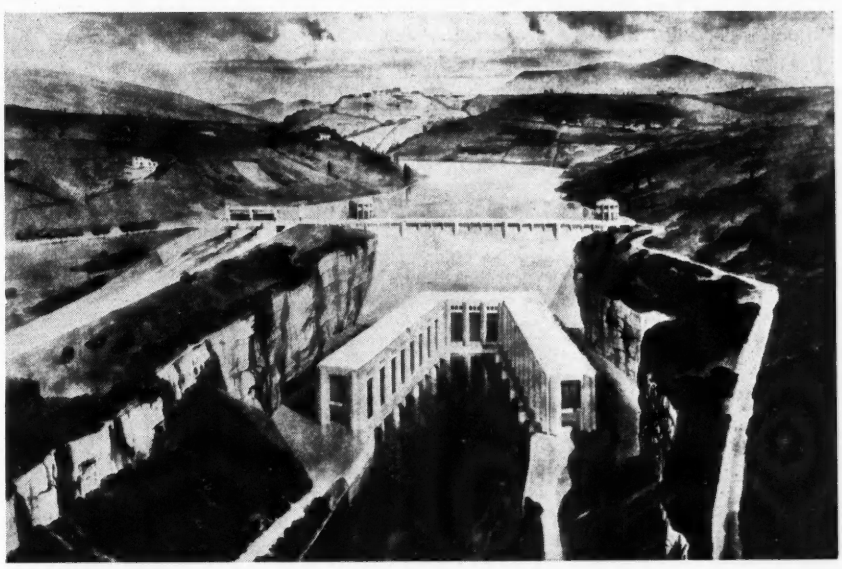
Each meter is required to complete three consecutive, direct, separate runs within close limits of accuracy, and practice proves that such a requirement does reduce the later service troubles with prepayment-meter mechanisms. A preliminary test, carried out on such separate racks, ensures that only meters with prepayment mechanisms that are found to be in order pass to the other equipments for further testing.

New Water-power Plant on the Rhone

Work on 440,000-kW scheme now in hand

WORK has now been begun on a generating station at Génissiat in a narrow gorge of the upper reaches of the River Rhone about 14¼ miles down the river from the Swiss frontier. The ultimate installation will be 440,000 kW with an output capacity calculated at about 1,800 million kWh per annum.

At present the preparatory construction of a depôt with rail and road access on a plateau above the river has been completed, and two working platforms, from which stones and rubbish can be dumped to form a barricade, have been thrown across the river at the extreme ends of the work.



Architect's impression of the proposed development at Génissiat, on the River Rhone, which will have 440,000 kW of plant

In the cliffs at the side, tunnels nearly 2,000 ft. long and about 860 sq. ft. in section are being built for carrying the water when the river is cut, permitting an outflow up to 46,000 cu. ft. per sec. When the plant is completed they will be sealed with boiler heads, which in the event of serious floods can be removed by mining. A line of flat piles will be driven to rest against the upstream edge of the bridge and a second line behind this temporary dam will be driven down to bedrock. On this bedrock the coffer dams and the main dam (about 330 ft. high) will be built, the plant itself resting on piles and on the alluvium.

The dam will raise the water level nearly to that of Lac Leman, from which the river runs, giving a head of 213 ft. and a flow of 28,000 cu. ft. per sec. for the turbines, which are to be grouped in two sections, one on each side of the river, with the upper ends connected by a gallery upon which the controls are located. Each section will comprise four vertical 55,000-kW turbo-alternators. Generation voltage will be stepped up to 220 kV by direct-connected transformers and the output will be taken to a distribution station on the plateau.

Conduits dug in the rock at the sides will take the water from intake towers above the dam to the various turbines. The dam and reservoir will act as a daily flow regulator, the water level varying as much as 16.5 ft. per day. Seasonal regulation will be provided by Lac Leman. Excess water up to 140,000 cu. ft. per sec. will normally be conveyed by a spillway to the river bed at a point below the lower coffer dam.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Change-overs and Power Factor

An interesting point affecting power users arises in connection with kVA charges and I would be glad to have your readers' comments.

Consumers with an average load of small d.c. machines paying round about £1 per kW of maximum demand per quarter are often faced with a much larger charge when changing over to a.c., due to the power factor having to be taken into account. With a kVA charge of £1, the standing charge can be increased by as much as 50 per cent.

Who is liable for the cost of power factor improvement? The consumer does not ask to be changed and anticipates a reduction in running costs due to the grid scheme. He will, of course, gain on purchase of new machines in future, but this does not offset his increased running costs.

Ipswich, *February 16th.* S. E. CAWTHRA.

Plastics for the Electrical Industry

In Dr. Blakey's article on this subject in your issue of January 21st there was a reference, on page 84, to "Siluminite," one of the registered trade marks of this company. The author of the article classes "Siluminite" with certain other materials and describes it as consisting of hydraulic cement composition with mineral filler. We would like to say that this description, as well as the brief details given of the technical characteristics of the material are liable to be misleading. We have received communications from customers who have been seriously perturbed at the suggestion that mouldings which they are employing specifically for their insulating qualities should possess high moisture absorption characteristics, while we may add that one hardly associates electric proof strength figures of even 50/60 V per mil at 20 deg. C. with very high moisture absorption.

The trade mark is applied to a variety of materials of our manufacture, ranging from special asbestos papers to various types of moulding work covering a wide field of application in the electrical industry, so that it is necessary to use an adequate description of the product in addition to the trade mark. In view of the fact that the mark "Siluminite" does not apply to products capable of being associated with the other examples given, we shall be glad if you will arrange for the necessary correction to appear.

Turners Asbestos Cement Co.,
F. D. MAWSON,
Manchester, *February 15th.* *Manager, Electrical Dept.*

[Dr. Blakey has seen the above letter, and replies as follows: "The trouble appears to lie, as Messrs. Turners point out, in the fact that they classify under the trade name "Siluminite" a large number of different insulating materials having very different properties. It is always difficult when writing an article of this sort to give representative figures for a class of compound which will be applicable to all the different materials which might be classified in this grade. My object in giving examples of trade names covering the different classes was merely to put the reader in touch with the various manufacturers so that they might write for fuller details of any varieties in which they were interested. It would obviously be impossible to include in the table all the different varieties of all the types of plastics which are on the market without producing something so cumbersome that nobody would read it."]

Boiling-plate Characteristics

Your correspondent "J. B." raises the question of my choice of utensils with which to test the different types of hotplate. The selection for each test was based on the principle of omitting the type of pan least likely to be used with the particular plate and using the other two types. I cannot agree with "J. B." that it would have been better to test each plate with all three types of utensil.

In the case of the low-voltage radiant plate the extra cost of the transformer can be justified only by the saving of expenditure on special utensils, so it would have been quite misleading to quote figures for this combination of plate and utensil, which, incidentally, gives very poor results. Moreover, tubular-sheathed plates are not ordinarily used with special utensils, although, in fact, they give good results with them, so this plate was tested with enamel and ordinary aluminium pans.

The choice of utensil for use with the "Chromalox" plate was made after a consideration that this plate might be regarded as a solid plate in which the thermal capacity has been reduced to the utmost. I therefore decided that it would be quite fair to give it the benefit of the special utensil although this plate gives quite good results with cheap enamel pans.

In view of the fact that radiant and semi-radiant plates are fitted to cookers with solid-topped grill-boilers it would seem a good idea that the bases of special utensils should be not only flat but also provided with a permanent matt finish of high absorption factor. This type of pan could be recommended for any combination of hotplate and grill-boiler.

My final remarks in favour of semi-radiant plates were an expression of my personal opinion of the most likely trend of development in the near future. I do not think that the tubular-sheathed plate will be ready to replace the solid type generally until the removable reflector is discarded. Personal experience at home of a plate of this type has convinced me that it would be too much to expect consumers generally to keep these reflectors bright. The results of most spill-overs can be removed quite easily, but if fat splashes or spills on to the reflector and burns on I find that the usual steel-wool is quite ineffective. The only way I have been able to get the reflector bright again after an accident of this kind is by removing it and heating to red-heat for several minutes before cleaning. The German "Prometheus" and the American Westinghouse "Corox" plates of this type have no exposed reflector.

I have made a distinction between commercial and domestic cooking so far as hotplates are concerned, because in the former case cooking is done more to schedule and therefore the slow initial heating of solid plates is of small importance. Moreover, in commercial cooking self-contained equipment usually relieves the hotplates of such heavy-duty operations as deep frying. Again, in the case of domestic cooking there is more likelihood of the electrical equipment sharing utensils with a coal-fire, which is a point against the solid plate for domestic purposes.

There is a slight misprint towards the end of my article when the dimensions of the standard rectangular plate are given as 8½ in. by 6½ in., instead of 8½ in. by 6 in. The estimation of 16 per cent. of the plate area left uncovered with an 8 in. diam. pan is based on the correct dimensions. I should also like to make it clear that only one pan of 8 in. diam. of each type was used throughout the tests.

I have not made a study of the current leakage from hotplates, although I have received a shock from a utensil on a badly earthed sheathed-wire plate. In this connection I can only refer Mr. T. C. Gilbert to figures of insulation resistance of hotplates given in the recent I.E.E. paper by Mr. O. W. Humphreys. As typical figures for modern 8 in. diam. solid and tubular-sheathed plates, Mr. Humphreys quotes figures of 250,000 ohms and 40,000 ohms respectively. These figures are for plates at maximum temperatures with no utensil and are shown to be a great improvement on similar figures for plates of five or six years ago. W. B. PARKER.

Monkseaton, Northumberland, *February 19th.*

Mr. W. B. Parker's article in your issue of February 11th contains a suggestion that a thermostat should be incorporated in a solid boiling plate. An arrangement of this kind was offered in the United States and, I believe, in Germany eight or ten years ago under the trade name of "Wesix," but I do not know whether it ever became a commercial success. Details of the device can be obtained by reference to the back files of the American publication *Electrical Merchandising.*

London, W.C.2, *February 21st.* ALAN WRIGHT.

American Interest in Rural Work

In the United States a great deal of interest is being shown in rural electrification. A number of years ago, the major technical institutions set up the American Engineering Council, which formed a Public Affairs Committee for Rural Electrification. This Committee has been studying the problems of rural electrification for the past two years and has issued two annual reports. It is eager to obtain information of the conditions in this country, and to that end I have in the past sent it copies of papers and articles, and extracts from the technical Press on the subject. I may mention that it is mostly extracts from your own journal which I find most useful.

The Committee has now asked me to act as correspondent, and I should therefore be glad if any engineers who have data which they think would be suitable for this American Committee would sent it to me for transmission. Such information would be treated confidentially if required.

I should mention that this work of mine in no way touches the American Institute of Electrical Engineers, for, although I am a member of it, the local secretary is Dr. A. P. M. Fleming. I do not want people to think that I have taken over any of the work so admirably done by Dr. Fleming.

19, Welwyn Park Avenue, G. V. HARRAP.
Beverley High Road, Hull, *February 18th.*

Applying for an Appointment

It is remarkable that a chief electrical engineer actually believes—and openly declares—that jobs are given out in this rose-tinted world on merit! If he had only stated the name of his undertaking, he would never have needed to advertise for a man again; his waiting list would run into thousands by the first post. My experience has been to the contrary. Anyone looking for a job nowadays must, like the principal character in *I Pagliacci*, on with the motley and laugh, though his heart be breaking. He will need all the moral courage of Punchinello to keep him going until, at last, he is fortunate enough, unwittingly, to apply for a job that no friend or relative of the powers that be wishes to fill. Cos ϕ.

February 21st.

Leakage Trip Settings

Regarding the article headed "Mine Switchgear" on page 196 of the ELECTRICAL REVIEW on February 11th, the suggestion of settling definite minimum leakage-trip values should be welcomed, particularly in the cases of direct-acting leakage trip coils working by the usual phase-balance method with three current transformers.

Among the difficulties encountered in the provision of suitable leakage trips is the one that different types of switchgear by one manufacturer will not give the same leakage tripping values. The latter depend upon the ampere-turns necessary for the particular type of gear, and in one case may be 20 per cent. and in another 50 per cent. of the nominal full-load primary current of the current transformer. One point which is not always appreciated is the considerable increase of minimum tripping value when the switchgear is subjected to a three-phase test by passing current through the three primary windings of the current transformers to a balanced load and diverting one phase through an adjustable resistance to the earthed neutral point of the supply generator, thus imitating as near as possible a leakage fault in service.

In these conditions current is wasted in magnetising the other two current transformers and does not pass through the coil. Whereas on a single-phase test the coil would trip at, say, 20 per cent. of full load primary current, on a three-phase test the proportion would be in the region of 35 per cent., depending upon the VA output of the current transformers. The greatest difficulty is experienced when a leakage coil is required with a low minimum operating value when the current transformers are specially wound with less than the standard number of ampere turns to withstand the effects of short-circuit current. Due to the restricted output of the transformers the coil which under normal circumstances would operate at, say, 20 per cent., would require 60 per cent.

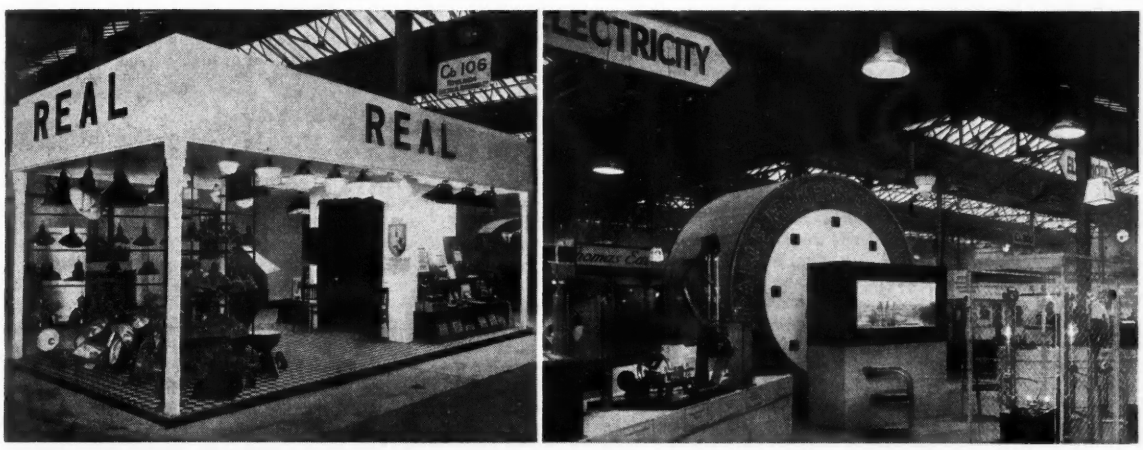
In this case the most satisfactory way is to include a sensitive relay, which is more expensive and requires auxiliary contacts for the circuit-breaker and a source of tripping supply. The leakage coil on a circuit-breaker reaches its maximum reactance with cores touching and if the total impedance of the secondary circuit is too high, the current transformers cannot deliver the necessary VA for operation. The final test result is obtained by increasing the primary current and, if necessary, lowering the core, thus reducing the initial reactance due to the larger air gap. The optimum point of a leakage coil is reached when an increase of turns (which increase the impedance roughly proportionally to the square of their number) is such that even worse results are obtained.

Where discrimination is required for leakage gear on the system, a relay with definite minimum time characteristics is the best solution. Another case arises in connection with power transformer control when it is desired to fit leakage gear that is far too sensitive to be incorporated in the breaker itself and thus requires a relay. If the relay is instantaneous in action there is the possibility of unwanted tripping when switching in the transformer due to the magnetising current circulating into the relay unless the latter is set for a high value. Although this can be defeated by shorting the coil at the instant of closing, through a time limit fuse and tumbler switch, the condition cannot be met should the feeder fail and supply be restored from a distant point, assuming the transformer breaker is closed and the relay set at a low tripping value; neither would charging resistances in the breaker help in such a case. The solution is a more coarsely set leakage coil with a time lag of approximately 1 to 2 sec. or a time-delayed induction type relay.

It would assist the switchgear manufacturer if a definite value of leakage could be arrived at by the users, but if this is impracticable such information as whether the leakage gear is to be discriminative or not, what is the breaking capacity and current, transformer ratio, and whether feeder or transformer protection is employed should be submitted in the early stages. With present-day knowledge of the available ampere turns on current transformers for short-circuit conditions, it is not difficult to forecast the approximate tripping value.

I believe that in many instances sensitive settings are not essential as the leakage current will increase under such fault conditions and operate the trip coil. H. T. STRATTON.

Birmingham, *February 21st.*



The stands of Rowlands Electrical Accessories, Ltd., and the Cable Makers' Association at Birmingham

Refusal to Connect

Mr. N. Hunter does not dispute my statement that this job was carried out according to the I.E.E. Rules. Now the Electricity Commissioners state quite definitely that any installation complying with the Rules shall be deemed to satisfy their Regulations. Surely this should also satisfy any supply authority in the country.

It simply amounts to this, that on a job consisting of ten tiny fans, not one of which consumes more than a quarter of an ampere, each one separately fused, Mr. Hunter thinks that it is not an unreasonable stipulation to insist that a "suitable distribution board to supply the *various* circuits" should be installed. Surely this is carrying things too far and causing unnecessary trouble and expense to the contractor!

Leeds, *February 19th.* C. J. GUMMERSON.

I was interested to read the correspondence which has appeared on this subject, but I am still at a loss to know why Mr. Hunter refused to connect up the installation which has been described. In order to assist other contractors in avoiding the same pitfall, perhaps Mr. Hunter will give us "chapter and verse" of the regulations upon which he bases his refusal. I must say that I consider that Mr. Gummerson's method of distribution under the circumstances was an excellent one; each fractional h.p. motor was protected by a separate sub-circuit and a triple-pole switch.

Mr. Hunter sees nothing extraordinary in stipulating that all the motors must be fed from a single distribution board. Perhap he doesn't; but I should imagine the client would when he received a bill three times the amount it need be.

London, W.C., *February 21st.* W. E. STEWARD.

Meetings and Discussions

The causes of ignition of anæsthetic gases in operating theatres are considered in two papers, by Professor W. M. Thornton and Dr. E. H. Rayner, read before the I.E.E. yesterday (Thursday). The method of driving the various motions of single-bucket excavators was dealt with by Mr. W. Savage at the Institution of Mechanical Engineers last Friday. A three-part paper touching upon the constructional, mechanical and electrical aspects of the Galloway water-power scheme was presented at this week's meeting of the Institution of Civil Engineers. Other subjects dealt with in this section are torsion meters (Dr. C. V. Drysdale) and thermal storage radiators

Electrical Risks in Anaesthesia

POSSIBLE electrical causes of the explosion of anæsthetic gas-mixtures employed in hospital operating theatres are discussed in two papers that were read at the INSTITUTION OF ELECTRICAL ENGINEERS in London on February 24th.

Ignition of such gas-mixtures is possible by means of sparks of an electrostatic origin, by the hot wires of cauteries, or by defective lamps used for examination. The paper by Dr. W. M. Thornton states that the proportions of ether and oxygen and air within which ignition is possible vary with the type of source. With hot wires, such as cauteries, ignition can occur within limits as wide as 3 to 80 per cent. of ether in oxygen. With sparks in general the limits are much narrower. Dr. Thornton has determined these limits, and the least currents that cause ignition when broken slowly or suddenly, or by fusing wires. Second only to hot wires as a possible risk are the fizzling sparks at a slower intermittent break of circuit between fine wires. When the current is kept below certain well-defined values ignition can always be prevented. It is then only necessary to specify that the total resistance of the circuit for any given voltage shall be such that currents above certain values cannot under any circumstances flow in the circuit. A factor of safety of 2 is ample.

Ignition is not a simple thermal phenomenon. The start of the chemical combination that leads to an explosion is essentially electrical, an "activation" of the mixture. The advantage of using low-voltage apparatus can scarcely be exaggerated, though clean breaks are not likely to be a source of ignition in medical apparatus. The influence of inductance is to intensify a d.c. spark at break by adding to the circuit voltage an inductive transient component which may be much greater than the battery voltage. Ignition by break sparks depends more on the initial voltage-gradient in the break than on the energy of the spark. This transient voltage can be suppressed by connecting across the break either a resistance or a capacitance.

The Use of Low A.C. Voltages

For electro-medical apparatus of the sort under consideration a.c. transformed down so as not to exceed 20 V is often employed. Small inherent inductances in a.c. circuits may make them ignite ether mixtures more readily than non-inductive d.c. circuits, a result of practical interest in electro-medical technique. The rise of voltage due to inductance in a given circuit is greater in proportion to the applied voltage when the latter is small, and it is, therefore, of the first importance to keep all low-voltage circuits as nearly as possible non-inductive and to use resistances designed for this purpose. Voltages not higher than 2 or 3 V are indicated for inspection lamps when a.c. must necessarily be used.

With so many inflammable gases, the current required to start ignition does not depend upon the proportions of ether in the air or oxygen. The same current, 0.32 A, fired every mixture of oxygen with from 3.0 to 83 per cent. of ether. This current was not sufficient to heat the wire to the point where it would glow or be visible in darkness, and the total power given to the wire was about 0.25 W. The temperature was sufficient to burn the skin, and is therefore comparable with that associated with cautery conditions. Thermionic emission from a hot wire begins at about 300 deg. C.

Ether-oxygen explosions can be very violent, and the burning of these rapidly combining gases, though transient, may be very severe. A sustained stream of sparks could ignite any inflammable mixture.

Static sparks are almost impossible within the mouth or throat, where the moisture of respiration prevents any local concentration of surface charge and of rise of potential. Sparks due to the sudden complete interruption of the lamp or cautery circuit are equally rare, but the author's experiments show that it is doubtful whether a cautery should ever be used with ether-oxygen mixtures, except under very carefully guarded conditions of current and temperature. Cauteries should, in fact, only be used for throat operations, at the temperatures that are necessary, with an anæsthetic that is much less inflammable than ether-oxygen. A pamphlet on the precautions to be taken in surgical operating theatres was issued last year by the Ministry of Health.

The second paper, by Dr. E. H. Rayner (National Physical Laboratory) is confined to the generation and accumulation of static charges, irrespective of the supply or uses of electricity. Investigations were carried out in many hospitals in consultation with the Medical Research Council and the Royal Society of Medicine.

They have shown that electrification (frictional in character) can frequently be caused without difficulty by the movement of fabrics over the surface of equipment commonly used in hospitals. The possibility of electrification depends upon some part of the equipment or patient being insulated. Rubber tyres on the legs of tables, patients' trolleys, anæsthetic and other apparatus are important factors, as are also rubber mattresses and sheets, and the nature and electrical resistance of the floor.

The risk, which may be dangerous, is said to be very small if the humidity is as high as 65 per cent., but a warm blanket from a hot cupboard may require a long time to attain to hygrometric equilibrium with the surrounding atmosphere. It is very desirable to equip apparatus with earthing chains trailing on a semi-conducting floor. Conducting rubber, which is now available, promises to be better than chains.

The possibility of defective action of high-pressure gas equipment giving rise to ignition or explosion must be kept in mind.

Excavator Drives

THE development of single-bucket excavating machines is dealt with in a paper by Mr. W. Savage (Ruston-Bucyrus, Ltd.), which was read at the INSTITUTION OF MECHANICAL ENGINEERS in London on February 18th. Single-bucket machines provided with an independent drive for each motion are now almost exclusively driven by electricity. The various systems employed are mentioned briefly.

In the Diesel-electric system power is provided for the separate hoist, swing, and crowd motors by a single d.c. generator driven by a Diesel engine. The a.c.-d.c. system is similar except that an a.c. motor replaces the engine as prime mover. In each case the three motors driving the motions receive their power from one d.c. generator, speed control of the motors being obtained by means of series resistances and main current controllers. Other methods of speed control have, however, been adopted in order to attain as nearly as possible the desirable characteristic of high torque at low speed and reduced torque at high speed. The Ward-Leonard system of control is generally accepted as the best form of electric drive for excavators.

Simultaneous operation of crowd and hoist, hoist and swing can be carried out without any mutual interference, while the torque-speed characteristic desired in excavator service is obtained with high efficiency, low maintenance cost, and ease of control. Regenerative braking is also possible with this method of drive so that high rates of working and reduced power consumption are possible, and clutches can be eliminated, thus considerably simplifying the mechanical equipment of the excavator.

Motor Armatures in Series

The Gilbert Austin and the British Thomson-Houston "S.C." schemes in common with the a.c.-d.c. system utilise an a.c. motor or internal combustion engine to drive a single d.c. generator providing current to three electric motors operating the various excavator motions. The three motor armatures are all connected in series and carry the constant current delivered by the generator, which is of special design; their fields are supplied with separate excitation and control is effected on these fields. The requisite speed-torque characteristic is obtained in these systems by the provision of auxiliary devices, such as small d.c. generators driven by the motors and operating on their respective motor fields.

The systems of electrical operation outlined are usually applied to machines from about 2 cu. yd. capacity upwards. The ingenuity of the mechanical engineer has been taxed to a greater extent in the design of the smaller machines, which below 2 cu. yd. capacity can generally be designated "universal," that is to say, they can be fitted with a wide variety of front-end equipments. Machines of this group employ a

single power unit, generally a Diesel or petrol engine, and in some cases a single electric motor. Whatever the prime mover used, the coupling of the various motions is accomplished by friction clutches.

Large excavators driven by internal combustion engines are not self-starting. They generally have an auxiliary petrol engine to turn the main engine; or an electric starter in the same way as a motor car, or a compressed air starter. One scheme employed for levelling and equalising with the aid of hydraulic jacks uses a separate electric motor and pressure pump for each hydraulic cylinder, controlled by apparatus equipped with mercury switches, and so arranged that when the machine becomes out of level, the appropriate switch starts the necessary pump, or pumps, to restore level. The mercury switches then cut off the pumps, which remain out of operation until further disturbances take place. This levelling device is more attractive where gradients from 3 to 12 per cent. are encountered.

The author's firm introduced an all-welded shovel boom in 1925 and an all-welded truck frame in 1928. Welding has in some cases an advantage over cast-steel construction, especially where the thickness of metal must be minimised. A welded structure, particularly for thicknesses below ¾ in., has a uniformity which may not be obtained in a steel casting, and weight can be controlled within much finer limits. This is particularly advantageous on small machines for high-speed operation where weight is a very important factor.

The use of welding has enabled a valuable saving in weight to be effected by dispensing with the doubling of metal thickness in flanges for riveting. The welded box section represents the ideal practical form of boom construction. Welding has revived the all-steel dipper handle, which has been quite successful.

On electric excavators with independent drive to the various motions the dipper handles are racked in and out by a separate motor mounted on the boom. The balanced hoist permits the use of dippers of greater capacity, operating at higher speeds, without any increase in the size of the electrical equipment. As compared with riveted booms, welded construction allows the working load to be increased by about 15 per cent., or permits the radius for the same working load to be enlarged by about 8 per cent.

Water-power in Galloway

A LONG paper in three sections, each dealing with a different aspect of the Galloway hydro-electric power development scheme, was discussed at the INSTITUTION OF CIVIL ENGINEERS in London on February 22nd.

The first section of the paper, by Messrs. W. Hudson and J. K. Hunter, is written with special reference to the constructional works and is accompanied by statistics and thirty-six sheets of drawings, &c. Constructional engineering contracts accounted for £1,840,000 of the total cost of £3,000,000. The work was undertaken in two stages and occupied five years, being completed in 1936, under the direction of Sir Alexander Gibb and Partners in co-operation with Messrs. Merz & McLellan, respectively civil and electrical consultants.

The second section of the paper (with fourteen sheets of drawings), by Messrs. W. Hawthorne and H. Williams outlines the purpose of the scheme, which is to supply power during times of peak loads to the industrial areas of Central Scotland and North-West England. The authors are more particularly concerned with the mechanical and electrical plant (102,000 kW in five stations) and the results obtained in operation.

The new Fulham central sub-station is nearing completion. Our photograph shows the front main switchroom containing equipment controlling two 15,000-kVA, 6.600/660-V transformers. There is space in the building for two similar transformers [*Elec. Rev. photo.*

Two of the stations are unattended, under remote supervisory control. The main contractors were the English Electric Co., Ltd. (turbo-alternators, switchgear and auxiliaries), A. Reyrolle & Co., Ltd. (h.v. switchgear), and W. T. Glover & Co., Ltd. (overhead lines).

All the stations are "selected" and all energy produced is taken by the Central Electricity Board for distribution over the national grid. The successful results obtained have been largely due to close collaboration between the Galloway Company and the C.E.B., which has ensured that water is available when required and that load can be taken when there is a prospect of losing units by spilling at the dams. The output during the first twelve months of full operation (242 million kWh), was considerably above the estimate on which the scheme was based.

In addition, the scheme has been demonstrated to possess features which, although not readily expressible in money, are very real and valuable. They include quick starting-up, both normally and in emergency (68,000 kW in 10 min., or 103,000 kW in 25 min.); quick shutting down when industrial load is suddenly reduced (all load can be dropped in five minutes) without loss of water; maintenance of the voltage on the long Glasgow-Carlisle transmission line; regulation of the grid frequency in Scotland and N.W. England; and ability to supply cheap energy during the summer when efficient steam plant is being overhauled.

The Galloway district is subject to severe thunderstorms; the grid line is not often put out of action, but the 11-kV lines are shut down comparatively often. Precautions include the provision of lengths of underground cables between the switchgear and overhead line terminals, the grading of insulators on the first few spans of the lines, and the installation of surge absorbers, expulsion gaps and lightning arrestors.

The main lightning trouble has been the frequent disorganisation of the P.O. telephone system, both directly and by falling trees, so interfering with communication.

The practical impossibility of obtaining low earth resistances due to the rocky ground complicates the operation of protective gear. There has been very little trouble with the plant, in spite of the fact that much of the equipment was novel and there was no trial running before it was handed over.

Bad Weather Effects

The weather conditions have been more severe than was anticipated, but the only anti-frost provision found necessary was local heating for valves and electrically operated equipment in exposed places, generally by means of small metal-clad electric heaters. During the severe blizzard of February, 1933, an overhead spur line was brought down within 4 ft. of the ground with a snow-sleet load of 4-in. diameter on the 11-kV conductors. Contrary to expectation, most of this line apparently recovered its original sag, and the damage might have been confined to a few broken insulators and some bent ironwork had not some of the copper become annealed owing to the lines swinging together, and the protective gear having been rendered inoperative to maintain the supply. When the snow cleared it was found that one section which had been kept alive on the ground had actually burned the ground and rock for several yards. No poles were broken, presumably because the boggy ground allowed them to "give" a little.

The present staff numbers six for administration, forty-eight for operation, and fifteen for maintenance. The cost of the whole development as now in service, including 11-kV lines, land and all expenses, was £28.3 per kW of power available. The hydraulic works accounted for 65 per cent. of the expenditure. At the time that the Galloway orders were placed a modern base load steam station could have been built for from £14 to £17 per kW installed.

The third section of the paper, with two sheets of drawings, is by Mr. R. W. Mountain and has special reference to the scheme's interconnection with the national grid, and method of obtaining load transfer.

The requirement was to transmit from Galloway 50,000 kW each to the industrial areas on the Clyde and Mersey. The capital expenditure by the C.E.B. on the equipment used for interconnecting the water power system with the 132-kV grid was estimated at £346,000 out of a total expenditure on the South Scotland scheme of £869,000. The present electrical

requirements of Central Scotland and North West England together amount to 4,700 million kWh per annum, with a maximum load of 1,580,000 kW.

The link consists of 121 miles of 132-kV line with step-up transformers adjacent to the water power stations and high-voltage switchgear concentrated near three of the five stations. The switchgear at Tongland is of special design and is the only example of completely metal-clad 132-kV switches in Great Britain. They are of Reyrolle make and the transmission lines of B.I. construction with B.T.H. open-type switchgear and 30,000-kVA non-resonating transformers, Bruce Peebles 15,000-kVA transformers and "Metrovick" 30,000-kVA transformers.

The total capital and working costs of the Galloway scheme are a little under £240,000 per annum which, with an output of 180 million kWh per annum, corresponds to a total cost of generation of 0.32d. per kWh. Therefore, without allowance for spare plant or for the cost of additional interconnecting equipment, the actual total generating cost is about 75 per cent. of the equivalent cost from the most modern steam station. This comparison is only valid if water is available to operate the hydro-electric plant to its maximum capacity at times of peak load on the system.

Torsion Meters

THE measurement of mechanical power was the subject of a lecture delivered by Dr. C. V. Drysdale at the JUNIOR INSTITUTION OF ENGINEERS in London on February 11th. He pointed out that electrical and other types of speedometers were accurate and easy to use, but the measurement of torque had presented great difficulties. In 1909 Denny and Johnson devised an electromechanical torsion meter which measured the angle of torsion in a ship's propeller-shaft by causing it to vary the air-gap between two magnet cores with reasonably accurate results. In 1920 J. M. Ford introduced an induction torsion meter in which an iron core normally equidistant between two transformers was displaced by the torsion of the shaft, thus increasing the secondary e.m.f. of one transformer and diminishing that of the other, giving a resultant e.m.f. which could be balanced against that from an exactly similar system in which the iron core could be displaced by a micrometer screw, which therefore measured the displacement or torsion angle directly. This device, which had been constructed by Siemens Bros., had proved very satisfactory and over 500 ships, including the *Queen Mary*, had now been equipped with it.

In 1924 E. B. Moullin devised a torsion meter on the same principle as that of Denny and Johnson, but with two nearly closed magnetic circuits on opposite sides of the shaft which tended to eliminate any errors from lack of centring or whip of the shaft, and this had been constructed by the Cambridge Instrument Co.

The Royal Aircraft Factory at Farnborough had constructed an improved form of Ford torsion meter suitable for mounting on airplanes in which the airscrew was fixed to the rim of a steel wheel with radial spring arms, thus giving a torsion angle of about 4 deg. in a very short axial length. Six transformer elements were equally spaced round a disc also fixed to this wheel, and a laminated star wheel with six projecting cores was mounted on its hub, which was keyed to a sheave on the engine spindle. This torsion meter had proved remarkably reliable.

These instruments, however, only measured the torque, which must be multiplied by the speed to obtain the power; and the operating current had to be supplied and the indicating e.m.f. transmitted through slip rings, which needed attention to ensure perfect contact. Between 1900 and 1910 the lecturer devised various schemes. By mounting two similar star-shaped inductors on the two sides of a spring coupling and surrounding them with two stationary armatures bridged across by permanent magnets, the same magnetic flux must circulate through the two armatures and inductors, thus inducing two equal alternating e.m.f.s. Any twisting of the coupling would produce a relative displacement of the two inductors and therefore a phase displacement between the two e.m.f.s; so that if the e.m.f.s were adjusted to be in phase when no power was being transmitted and the two armatures were connected in opposition the vector difference would be proportional to the product of the speed and torque.

The most suitable simple indication instrument was an ordinary induction wattmeter having a metal disc moving in the gaps of two electromagnets connected to the two alternators and controlled by a spring and damped by a permanent magnet. If the spring was removed the wattmeter became an energy meter which would integrate the mechanical power. With two pairs of magnets operating in opposite senses on the same disc, one pair could be connected to the coupling and the other to the terminals of an a.c. generator or motor so that the instrument would indicate the difference between the electrical and mechanical power or the losses in the machine; while if the disc were suitably shaped and the control spring removed, it would indicate the ratio of the powers or the efficiency directly. This device was taken up by the Royal Aircraft Establishment about three years ago, and had now resulted in a dynamometer coupling which had realised expectations. The two alternators were excited by coils instead of by permanent magnets.

Thermal-storage Radiators

ELECTRIC radiators of the heat-storage type were discussed at the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on February 14th.

Mr. W. L. Shand opened the debate by referring to space-heating, particularly for domestic application, and endeavoured to outline the ideal product for the service. He spoke of the possibilities of increased revenue to a supply undertaking and the amelioration of peak load difficulties. He described the well-known principles of radiators and convectors and gave a brief account of four recent products from abroad whose principles are slow absorption of electricity, in broken periods, and regular and constant heat emission.

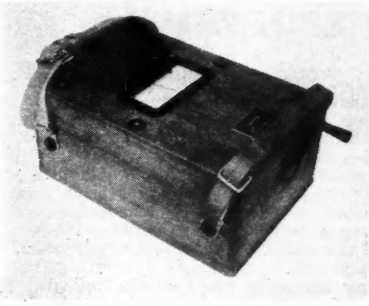
The great difficulty with space heating is the many and various demands that are made even in identical households or offices. It complicates the problem vastly when the individuals' idea of fresh air and comfort may go to opposite extremes.

On the question of avoiding peak loads the discussion revealed considerable divergence of opinion. As the peak was frequently a variable even in the same undertaking, the supply engineer was hard put to it to devise a means of circumventing it. One speaker humorously remarked that the discussion had taught him that the supply engineer was apt to term anything a peak except the deepest valley.

The Birmingham Electric Club

The annual dinner of the Birmingham Electric Club will be held on March 4th at the Grand Hotel, Birmingham, when Mr. F. S. Ette, the president, will be in the chair. Tickets (12s. 6d. each) can be obtained from Mr. A. T. Haywood, hon. social secretary, 24, Tamworth Road, Sutton Coldfield.

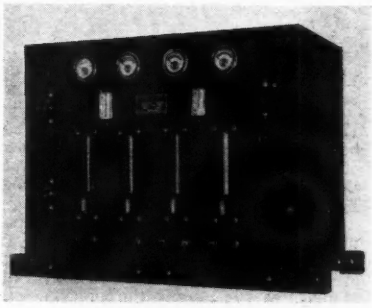
Two stands in the Birmingham Section of the B.I.F.—Donald Macpherson & Co., Ltd., and Vent-Axia, Ltd.



The new twin-generator "Megger"

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes



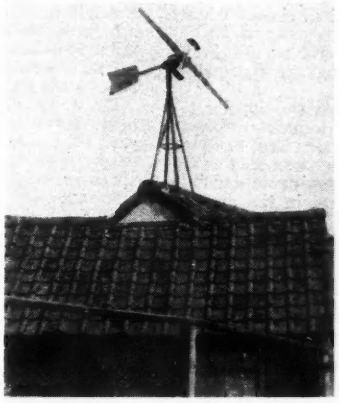
Philips type 1363 battery charger

A 5,000-V Insulation Tester

It was in 1899 that Mr. Evershed, of EVERSHED & VIGNOLES, LTD., Acton Lane Works, Chiswick, London, W.4, introduced his first insulation tester.

The company is now making "Meggers" rated at 100, 250, 500, 1,000, 2,500 and 5,000 V. The last mentioned has twin generators, connected electrically in series, mechanically coupled and driven through gear wheels. To allow the armature to come to rest slowly, even when the turning handle is stopped suddenly, a free wheel device is incorporated, which also ensures that the generator shall be driven in the correct direction. A centrifugally controlled friction clutch ensures that the maximum voltage applied shall be 5,000, the constancy of this voltage enabling tests to be carried out on installations having considerable electrostatic capacity.

The moving coil ohmmeter consists of two coils mounted at a fixed angle to one another and free to rotate in the field of a permanent magnet. Both coils are in parallel across the twin generator, one being in series with a fixed resistance and the other in series with the resistance under test. Thus an indication is obtained of the ratio of the torques exerted by the two coils, which depends only on the value of the resistance under test. The moving coil element, which is mounted on spring-supported jewels, is able to withstand a considerable amount of vibration and shock without injury. Two single-range scales are available for readings of 0-2,000 megohms and 8-20,000 megohms; in each case a system of guarding circuits is employed in the instruments to prevent error due to surface leakage. The instruments are fitted with two carrying handles and weigh 60 lb.



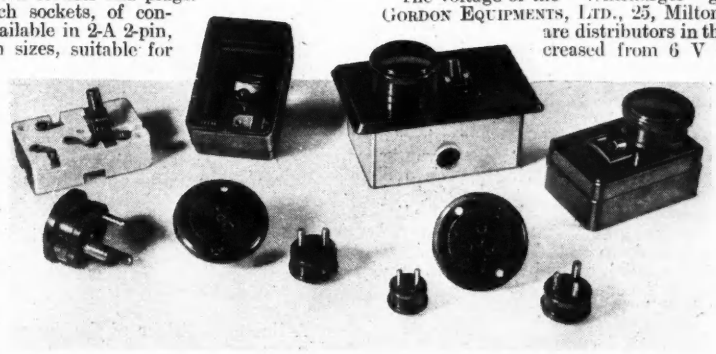
"Wincharger" mounted on a roof

Switches and Sockets

From CONTACTUM, LTD., Victoria Works, Edgware Road, London, N.W.2, we have received samples of a recently-introduced range of switch sockets and plugs.

Flush mounting switch sockets, of conventional design, are available in 2-A 2-pin, 2-A 3-pin and 5-A 2-pin sizes, suitable for fitting to the standard iron box with 2-in. fitting centres, or they may be mounted directly on the skirting boards. A 15-A size is made for flush or surface mounting, with two or three pins and is also available with an unusually simple sliding spring interlock fitted in the bakelite cover. Pressed steel or teak boxes can be supplied for all the flush mounting units. All models can be obtained in either white or brown. Ordinary 2-, 5- and 15-A plugs and sockets without switches are also made.

In all the surface mounting sockets and switch sockets the covers fit completely over the porcelain bases.



A range of "Contactum" accessories: the sliding spring interlock can be seen (top left)

Battery Chargers

Included in a new catalogue which has been issued by PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2, are details of four new battery chargers.

Two of these types, 1363 and 1364, have been designed as flexible equipment suitable for use in the radio and motor trades, each having three circuits to charge at rates of from 1 to 6 A. Type 1363 will take a maximum of 36 cells and type 1364 will handle 60 cells, the total d.c. output of the chargers being 30 V, 6 A with a full load rating of 300 W, and 50 V at 6 A with a loading of 475 W.

For large service stations type 1366, which is capable of handling 800 batteries a week, has been introduced. There are four output circuits with capacities of 40 cells at 1 A, 40 cells at 2 A, 40 cells at 3 A, and 12 cells at 6 A. By means of the voltage tapping switches and resistance control in each circuit various combinations of charging rates can be obtained.

To meet the requirements of large garages and transport companies there is a new group of chargers known as E5, 6, 7, and 8. Each circuit is independently controlled and equipped with its own voltage tapping switch, variable resistance, ammeter, terminals and fuses. Each type takes 30 cells on each circuit, the total full load ratings being 1,500 W, 1,890 W, 2,275 W and 3,500 W, respectively.

Heating Attachment for Fans

The original "Driver" heating attachment for fans was described in our issue of September 10th, 1937 (p. 344). At that time it was available only for 8-in. fans. We have now received from W. T. DRIVER, 10, Store Street, London, W.C.1, an improved model.

Alterations have been made to increase the safety of these fan-heaters so that they can be used even in a children's nursery. The blades are no longer accessible at all from the front and a fine-mesh guard covers the whole of the rear of the heater so that it is impossible to trap the fingers. The larger sizes are now provided with three screws to hold the rear section of the case to the main body, in addition to the press fit.

Ten- and twelve-inch sizes are now available with loadings of 2 and 3 kW, switches being provided to give steps of 1 kW. The attachments can be supplied separately or as a complete unit with fan, light green or brown being the standard colours.

Wind-driven Battery Chargers

The voltage of the "Wincharger" generating sets for which GORDON EQUIPMENTS, LTD., 25, Milton Street, London, E.C.2, are distributors in this country, has been increased from 6 V to 12 V—the standard here for car lighting—with an output of 120 W. An illustration appears in the centre of the page.

The unit is normally mounted on a 5-ft. angle-iron tower and its centrifugal governor is claimed to maintain a constant charging rate in wind speeds down to 10 m.p.h. and to operate safely in winds at 70 m.p.h. owing to a wind-brake effect. A ball-bearing turntable allows the propeller to rotate freely and a lever stops it by moving it out of the wind stream. Grease-sealed bearings are employed for the generator. For heavier work a 32-V set is also available with an output of 650 W.

An Electric Flame Producer

Particulars of a device for lighting fires and cigarettes or for melting sealing wax have been sent us by PAPPU BROS., Edward Elliot's Road, Mylapore, Madras. The "Lecflame" consists essentially of two electrodes, one of which is drawn up by a solenoid against an adjustable spring to strike an arc when a push-button switch is depressed. When the arc is formed, pole pieces deflect it through an aperture of the container, the flame persisting as long as the switch is pressed. The device is intended for 220- to 250-V operation. Its external dimensions are 3½ in. by 3½ in. by 8 in., and its weight is 2 lb.

In the Courts

Theft of Electricity in Calcutta

The Judicial Committee of the Privy Council on February 17th dismissed appeals by two men who were alleged to have been concerned in the operation of a scheme whereby quantities of electricity were stolen from the Calcutta Electric Supply Corporation. The hearing was reported in our issue of February 4th, page 168.

The appellants were Babulal Choukhani, a Calcutta cinema proprietor, who was sentenced to one year's imprisonment and to a pay a fine of one thousand rupees, on conviction for theft of electrical energy, and Sailendra Nath Mukherjee, an employé of the Supply Corporation, who received a sentence of two years' imprisonment on a charge of abetting him. They asked the Judicial Committee to set aside a judgment of the High Court of Judicature at Fort William, Bengal, confirming the sentences which were passed upon them by the Chief Presidency Magistrate of Calcutta.

It was stated during the hearing of the appeals that the Supply Corporation was led to suspect a leakage of some kind in 1933 and 1934 owing to a considerable discrepancy between the energy generated and that accounted for by sales. When inquiries were instituted it was found that, occasionally, the meters of certain consumers gave " minus readings " that was to say, they registered a smaller total consumption of electricity when read on some dates than they had shown when checked a week or so previously. In due course evidence of an extensive system of theft was obtained, and twenty-three persons were afterwards charged. Among those finally brought to trial were the two appellants.

Lord Wright, delivering judgment, said that the appellant, Sailendra Nath Mukherjee, was one of the organisers of a system of theft. The thefts which were charged against Babulal Choukhani were at his cinema. The facts as to the thefts were held to be proved both by the magistrate and by the High Court, and the main question raised in the appeal had been a question of law as to whether or not the trial of the accused men was vitiated by misjoinder of persons.

After reviewing the High Court judgment in some detail, Lord Wright said that the members of the Judicial Committee were of opinion that the points taken on behalf of the appellants failed, and that the judgment of the High Court was right and should be affirmed. Both appeals must be dismissed.

Pentode Valve Patent Action

In the Chancery Division on February 17th Mr. Justice Morton, after a hearing lasting for fifteen days, reserved his judgment in the motion made on behalf of the Mullard Radio Valve Co., Ltd., for leave to amend the specification of their letters patent No. 287958, dated December 24th, 1926, for a particular form of pentode valve. (Reported in the ELECTRICAL REVIEW of February 4th.) The respondents to the motion objecting to the proposed amendment were Electric and Musical Industries, Ltd.; Marconi's Wireless Telegraph Co., Ltd.; Standard Telephones and Cables, Ltd.; and Philco Radio and Television Corporation of Great Britain, Ltd.

The British Belmont Radio, Ltd., against whom the Mullard Co. had brought an action for alleged infringement of the patent, were not made respondents to the present motion for leave to amend the specification as that action had been settled subject to the present question of amendment.

The invention in question was " for improvements in or relating to circuit arrangements and discharge tubes for amplifying electric oscillations by means of thermionic devices," and the plaintiffs' proposed amendment was in substitution of claim 2 and read as follows: " The invention also comprises a discharge tube for amplifying electric oscillations comprising a screening grid between the control grid and the anode, characterised in that an auxiliary electrode is placed between the screening grid and the anode and is directly connected to the cathode so as to be maintained continuously at the cathode potential, whereby the increase of the screening grid current at the expense of the anode current will be substantially avoided."

Possible Danger from Fault Current

In the Chancery Division on February 18th Mr. Justice Simonds continued the hearing of the motion in which British Celanese, Ltd., claimed an order that the Derbyshire and Nottinghamshire Electric Power Co. should only supply electricity to the plaintiffs' factory at Spondon, Derbyshire, from the power company's generating station at Spondon from an isolated generator, or by such other means as should be practical to minimise effectively the danger existing to the plaintiffs' servants, agents, works and electrical system at Spondon by reason of the defendants supplying electricity in such a way, or under such conditions, as were not proper or effective to prevent such a faulty input in excess of the existing capacity of the protective apparatus in the plaintiffs' electrical system. (Reported in our last issue, p. 252.)

Mr. W. P. Spens, K.C., for the plaintiffs, said that the position, was that to connect the plaintiffs' factory to an isolated generator would deprive the defendants of their reserve generating plant. The result would be to cause danger to consumers who depended on continuity of supply. The plaintiffs were satisfied that an isolated generator could not be arranged, and therefore the parties had gone back to the alternative suggestion that the plaintiffs should grade their switches, which meant putting them out of operation in relation to the defendants' switchboard when they had powerful current-breaking apparatus. This would give protection to life, although it might fail to prevent damage to property. As a temporary measure it had been agreed that this was the only proper course to ask his Lordship to sanction pending the trial of the action. The alteration could be made by Sunday, February 20th.

After some further discussion his Lordship said that the matter could be mentioned to him again on February 22nd.

On Tuesday last Mr. Neep, for the plaintiffs, stated that technical experts on each side had agreed on the measures to be taken and the switches had been graded. The defendants had undertaken to keep those measures in force until the trial of the action, or further order.

His Lordship said that the undertaking of the defendants would be to maintain the works indicated and subject to that undertaking there would be no order on the motion.

Case Against Scottish Company Fails

At Linlithgow Sheriff Court recently the United Collieries Ltd., Bathville Brick Works, Armadale, was charged with a contravention of Section 136 of the Factory Act, 1901, by failing to observe Nos. 1 and 2 of the Electricity Regulations in consequence of which a youth received a fatal shock. A plea of not guilty was tendered.

Mr. J. W. Jones, Electrical Inspector of Factories, who had made investigations, said the accident happened in a brickyard on a pole adjacent to a brick-grinding house. The overhead wires on the pole were of two systems, one being approximately 120 V a.c. for lighting, and the other system approximately 550 V for power purposes. There was no visible difference in the appearance of the two systems of wires, and there was nothing on the pole to indicate that there were two different systems. The control for the lighting wires was at a distribution board in a shed about 200 or 300 yards away from the pole, and the control for the power wires was a sub-station about a quarter of a mile from the pole, and that sub-station was locked in accordance with the regulations.

On the pole in question there was a lamp which required attention from time to time. The power wires on the pole were on a branch line supplying a motor in the brick grinding house, and this meant that when operations were being carried out on the branch line the whole power system for the works had to be disconnected at the sub-station.

Replying to counsel for the company, witness stated that taking the system as a whole it was not the general standard system used throughout Scotland. He considered it was not good practice to have two sets of wires on the one pole despite the fact that they were leading from both sides. The system was perfectly safe if everybody knew that there were two systems on the poles and that they had to be switched off.

An electrician employed by the company said that along with deceased he was instructed to repair a faulty light at the brick works, and thought all the overhead wires were quite safe. He saw deceased climb a pole to put the light right. When he made a test the lamp lit up once or twice and failed and then the lighting power was switched off. Deceased took out the globe and lowered it to witness with a hand line. He then repaired the line. Suddenly he heard a shout and on looking up saw deceased held fast against the wires. Witness realised that deceased had been caught on the wire with the current on so he made a rush for the power station to get the power switched off. This was the first time he realised that the power was on. The power was switched off and when he went back to the pole he found deceased was still there. Witness, who had been an apprentice electrician for four years, and had undertaken repairs at the brickworks, said he never knew the poles there carried both systems of wiring until after the accident occurred. Asked if deceased would know about the wiring system, witness replied he expected he would as a linesman.

A linesman, father of the deceased, said he did not think his son had much experience of the poles in the brickwork, and he would not know the difference between the two systems of wiring. A consulting electrician said the use of bare wire was preferable to insulated wire on poles, particularly in the open air. In his opinion the system at the brickworks was in accordance with the standard practice elsewhere. No person should be repairing the wires unless the current was switched off.

John Duncan, superintendent of the electrical plant at Bathville works, said all workmen had been informed of the regulation that no repairs were to be carried out to electrical equipment until the power was switched off. Deceased had done several jobs of this kind before.

Mr. G. F. Sedgewick, Inspector of Factories, Edinburgh, who conducted the prosecution, contended there was definite negligence in the case, and said that stronger measures ought to have been taken to prevent a fatal accident of this kind.

Counsel for the company held that the company had taken all the means within its power to prevent accidents, and the regulations had been obeyed. The Sheriff found the company not guilty.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Electrical Equipment for New South Wales

H.M. Senior Trade Commissioner in Australia reports that a proclamation has been issued by the New South Wales Government prohibiting the sale or hire in New South Wales of certain electrical equipment without the approval of the Electricity Advisory Committee. The regulations will come into operation on June 3rd, and the electrical appliances affected are bread toasters, grillers with open or only partly enclosed elements, radiators, portable immersion heaters, kettles and saucepans, jugs with open elements, irons and leakage circuit-breakers (excluding earth-leakage relays). Importers of any of these prescribed articles will have to secure from the Electricity Advisory Committee a registered guarantee number, which, together with the letters "P.S.," must be stamped or labelled on every prescribed electrical appliance sold or hired. United Kingdom manufacturers and exporters of the electrical appliances in question who are interested in the New South Wales market will need to ensure that they are fully aware of the new regulations. A copy of the Proclamation and Ordinance (No. 54A) and a pamphlet containing explanatory notes relating to the matter are available for loan to interested United Kingdom firms, in order of application, to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference No. 20166/36 should be quoted.)

Employment in January

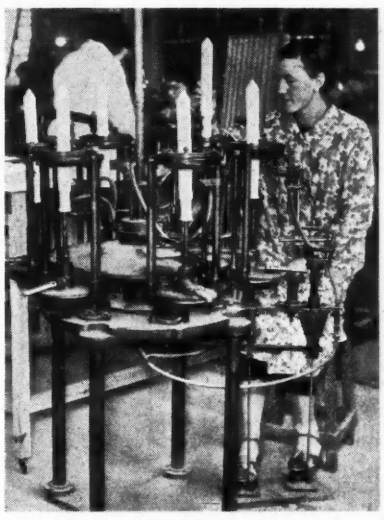
Employment in the engineering industry in January showed some decline in all districts and most sections of the industry, but remained very good in electrical engineering. According to the *Ministry of Labour Gazette* the number of unemployed in the engineering industry was 73,788, rising by 0.9 per cent. to 6.3 per cent. (6 per cent. in January, 1937). In the electrical engineering section the number of unemployed was 4,910, or 4.3 per cent. (3.3 per cent. in December and 3.5 per cent. in January, 1937). The unemployed in the electrical wiring and contracting industry numbered 4,440, or 10.8 per cent. (9.1 per cent. in December and 10 per cent. in January, 1937). In the cables, apparatus, lamps, &c., group the unemployed numbered 15,191, the percentage rising from 8 to 8.1. This compared with 10.4 per cent. for the corresponding month of 1937.

Irish Electrical Traders

Speaking at the recent annual meeting in Dublin of the Society of Electrical Traders, Mr. P. L. Edwards, the chairman, said that the Council viewed with the greatest concern the tendency on the part of national industrialists to import their electrical equipment from abroad. He announced that a deputation had been appointed to raise the matter with the Minister for Industry and Commerce, and that the Department had given them a promise that, in future, the Minister would do all in his power to ensure the local purchase of materials. The Society's arrangements with the Irish manufacturers were, on the whole, working quite smoothly, and further advances along those lines might be confidently anticipated. The Society numbered among its members Irish electrical manufacturers, and negotiations had been, and were being, carried on between the manufacturers and the other sections of the industry in order to secure smooth working. About two hundred applications had been received from traders all over the country for registration in various classes. The Allied Traders' Committee, by its report to the Council, had done much towards eliminating the abuses of the previous trade discount system. A special register of large buyers and commercial users had been prepared.

Making Tubular Lamps

Since we described its new factory in Abbeydale Road, Wembley (see August 13th, 1937, issue, page 220), the Union Lamp and Lighting Co., Ltd., has installed a number of special automatic machines for the manufacture of opal tubular lamps 1 ft. long by 33 mm. in diameter and with a bayonet cap at one end. Owing to the saving in labour resulting, the company's tubular lamps will in future be made of three-ply opal instead of two-ply. Other recent additions to the company's plant are special frosting vats for tube lamps. These are claimed not to cause any shock to the filament assembly through the bombardment of particles on the glass tubing. They also enable clear rings or designs to be made on the outside of the lamps to meet the requirements of the consumer.



One of the new automatic machines for making Union candle lamps [*Elec. Rev. photo.*

A Film of Malaya

On February 15th an interesting film lasting over two hours and showing scenes of life in the Federated Malay States, the home of rubber growing, was shown at the Royal Empire Society's headquarters by the Rev. Hamilton Aiken under the auspices of Mr. J. Lamont, director of W. T. Henley's Telegraph Works Co., Ltd., who occupied the chair. Sir Montague Hughman (chairman of Henley's) was in the audience.

Members of the City and Guilds Engineering Society at Callender's research laboratory

Works Visit

A large party from the City and Guilds Engineering Society visited Callender's research laboratory at Wood Lane, London, on February 12th and were conducted on a comprehensive tour, during which they inspected the apparatus, instruments and cables in the various departments of the laboratory. To-day (Friday) students of the Institution of Electrical Engineers will visit the laboratory.

Import Duty on Insulated Staples

The Import Duties Advisory Committee has given notice of an application for an increase in the import duty on iron or steel insulated staples. Any representations which interested parties may desire to make in regard to this application should be addressed to the secretary, Import Duties Advisory Committee, Shell-Mex House, Strand, London, W.C.2. not later than March 10th.

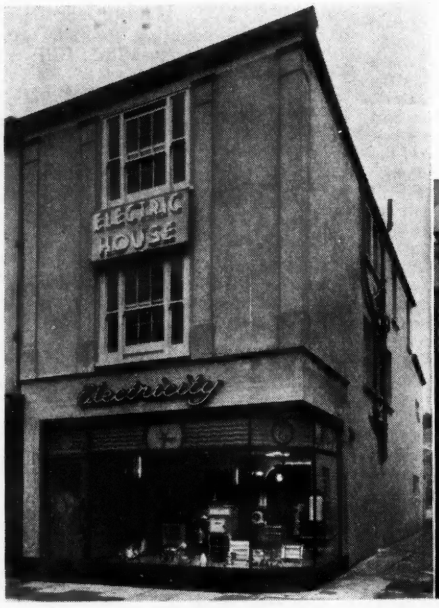
Cyprus Import Duty Reduction

An Order-in-Council dated January 27th published in the *Cyprus Gazette* announces a reduction of the import duty on certain electrical goods and appliances from 16 to 10 per cent. *ad valorem* (preferential tariff), and from 24 to 18 per cent.

ad valorem (general tariff). The goods affected are as follows:—Electric bell apparatus and parts thereof; electric lighting appliances, accessories, fittings and parts thereof, not being machinery; telegraph and telephone apparatus and parts thereof, including wire and cable; radio receiving and transmitting apparatus and parts thereof.

New Electricity Showrooms at Totnes

New branch showrooms have recently been opened by the Torquay Corporation Electricity Department at Totnes, an important market town. In view of the type of building prevailing in Totnes it was decided to adapt the old premises which were purchased to a semi-modern exterior, but the interior has been designed in accordance with modern practice. The E.D.A. electrical symbol has been fully exploited and in one case a bronze figure is used in an illuminated recess as a direction sign to the first floor fittings showroom. In addition to the main showroom, the demonstration kitchen (which seats thirty people) and the fittings showroom there are three offices, two store rooms, &c., all accessible from the rear of the building. Garage and workshop accommodation is also provided, making a self-contained sales and service unit.



Exterior and interior views of the new branch showrooms of the Torquay Corporation Electricity Department at Totnes

Runcorn Council Chamber Lighting

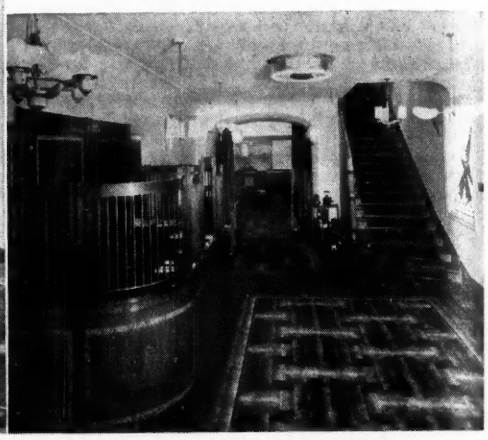
An excellent example of architectural lighting can be seen in the new Council Chamber of the Runcorn U.D.C. The only illumination is provided from an artificial laylight 11 ft. by 8 ft. placed in the centre of the slightly curved ceiling, the light being provided by four lamps only, and provides an even distribution of light. The installation was planned by G. V. D. Illuminators, Ltd., who also supplied the equipment, the wiring, &c., being carried out by the Mersey Power Co., Ltd., Runcorn. The Council's engineer is Mr. A. B. Cunningham.

Social Events

The new canteen, equipped with modern cafeteria and café service, was the scene of the recent annual dance of the office staff at the Guiseley (Leeds) works of Crompton Parkinson, Ltd. There were 250 people present, including the joint managing directors, Mr. Frank Parkinson and Mr. A. Parkinson, and a number of guests from the London and Glasgow offices. An excellent entertainment was provided, among the entertainers being the twelve "Parkinson-Paley" dancing girls, and various members of the staff who did conjuring and cards tricks.

Orders Recently Booked

With the object of modernising the grain storage facilities in Argentina the Argentine Government has decided to erect fourteen large grain elevators at the ports, to be followed later by a chain of smaller storage granaries throughout the grain-growing districts. Contracts have now been placed by the Government for the first six terminal elevators. The complete machinery equipment of four of the six elevators has been ordered from Henry Simon, Ltd., the contract, which is valued at £600,000, being the largest placed with a British engineering concern for grain-handling machinery. The four elevators are: Rosario Sud, 75,000 tons; Villa Constitucion, 54,000 tons; Quequen, 47,500 tons; and an extension of 60,000 tons to the storage accommodation of the B.A.G.S. central elevator at Ingeniero White, which was built and equipped by Henry Simon, Ltd., in 1932. The company will supply all the grain-handling, storage, cleaning and grain-shipping machinery and electrical equipment.



Elexcel, Ltd., Curtails its Range

To enable the company to concentrate upon bulk contracts, Elexcel, Ltd., has decided to discontinue manufacturing certain products. When the stocks held by the branch offices in London and the provinces have been disposed of, the following "Xcel" lines will no longer be available:—Storage tanks, immersers, vacuum cleaners, washing machines, boiling rings, urns, shop window heaters, motor car heaters, kettles, towel rails, warming plates, soldering irons, hair dryers, space heating apparatus and toasters. Until such time as the capacity of the factory is increased, the products will be restricted to domestic cookers, breakfast cookers, wash boilers, irons and fires. The Service Department will continue to operate at Victor Works, Broad Green, Liverpool, for the purpose of carrying out guarantee obligations, repairs and replacements on all "Xcel" appliances. In deciding to limit the range of products, the company believes that it will be in a stronger position than formerly to specialise in the development and manufacture of the few items which have hitherto provided the bulk of the output.

Electricity on the Farm

The Dumfries County Council Electricity Department recently introduced a new farm tariff under which electricity for motors is supplied at ¾d. per kWh. The new tariff has induced many farmers to install motors and sterilising equip-

Members of staff of the Guiseley (Leeds) works of Crompton Parkinson, Ltd., and from the company's London and Glasgow offices at the recent annual dance. Mr. Frank Parkinson can be seen on the left

ment, and the Department is receiving numerous inquiries. With a view to giving publicity to the new tariffs and uses to which electricity can be put on the farm the Department has recently been placing weekly advertisements in the local Press. These have now been brought together in booklet form with the title "Farm Flashes."

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-Making Industry announces that the "cost of living" figure on February 1st (57 per cent. above the 1914 level) will not involve any alteration in wages on the third pay day in March.

Steel Workshop Furniture

To most people in the electrical industry the name of Brookhirst is synonymous with control gear, and it is not generally known that the company also includes all-steel workshop furniture among its products. A few years ago the company was faced with the problem of increasing production facilities without costly extensions. The problem was solved by adopting all-steel workshop furniture, and the company was soon producing on a commercial scale. We have now received a booklet illustrating and describing some of the company's "Steelpact" workshop furniture.

For Sale

Birkenhead Corporation invites offers for the purchase of two 750-kW and one 400-kW d.c. turbo-generators, boilers and other plant.

Hull Electricity Department has for sale two Weir turbine-driven boiler feed pumps, &c.

See our Classified Advertisements.

Ex-British Westinghouse Association

The annual reunion dinner of the Ex-British Westinghouse Association will be held on March 11th at the Trocadero, London, W. Tickets (14s. 6d.) each can be obtained from Mr. L. S. Hawes, 14, Woodleigh Gardens, S.W.16.

Works Extension

Crompton Parkinson, Ltd., have sent us a photograph showing the progress which has been made with the extensions which are being carried out at their Chelmsford works.

Brighter Homes Exhibition, Birmingham

As in previous years, the Birmingham Corporation Electric Supply Department had a representative display of electrical appliances at the Brighter Homes Exhibition which was held

The Birmingham Electric Supply Department's stand at the local Brighter Homes Exhibition

in Bingley Hall, Birmingham, from February 2nd to 19th. As our picture shows, the display included a selection of electrical apparatus such as cookers and water heaters as supplied on hire terms by the Department.

E.D.A. Activities

The course of weekly lectures for electrical sales staffs of London departmental stores which is being given at the Building Centre, London, has been arranged by E.D.A. in response to many requests received from merchandising organisations for up-to-date information on electrical appliances in their relation to the electrical sales assistant. The first lecture, "Introduction," dealt with the directions in which the electricity supply industry is endeavouring to help retail sales through tariff reductions, publicity, the unification of supply conditions and the extension of household outlets for electrical fittings and appliances. Simple explanations of electrical terms and costs were also included. The subsequent lectures are headed respectively "Better Lighting," "The Home Installation," and "Selling Electrical Fittings and Appliances." The lecturer is Mr. P. Honey.

A conference of supply representatives was held in Leeds last week for the purpose of hearing an address by Mr. D. Bellamy (Hull) on "The Economics and Principles of Supply Costs and Tariffs." The conference was arranged in response to requests that this paper, which created so much interest at the sales management conference in London, should be given in this area. Mr. G. A. Vowles (Halifax) presided over an attendance of seventy, many of whom represented the accountancy departments of supply authorities. An interesting discussion took place.

An Electric Fire Display

An effective electric fire display was recently on view in the Wolverhampton Corporation Electricity Department's showroom window. As the accompanying picture shows, the display was of the Falk, Stadelmann & Co.'s appliances, and

A display of Falk, Stadelmann fires in the showroom of the Wolverhampton Electricity Department

included a neat layout of a variety of their electric fires. On the short platform of the display board stood the 2-kW "Sunlight" model which was introduced last year. Other models displayed included "Sunset," "Sunray," and the "Sunray B" reflector fire. "Efesca-Surves" electric labour-saving appliances, which include kettles, toasters, irons, cleaners, &c., were also mentioned, although not shown.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price February 23rd.	Fortnight's Inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal)... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£22 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¾d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll... ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ... ,,	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£177	£5 inc.
Grade II ... ... ,,	£125	£2 inc.
Grade III... ... ... ,,	£72	£1 dec.
c Brass (rolled metal 2" to 12" basis)... per lb.	8d.	—
c ,, Tubes (solid drawn) ... ... ,,	11¼d. to 11¼d.	—
c ,, Wire, basis ... ... ,,	8¼d.	—
c Copper Tubes (solid drawn) ... ,,	1/0½	—
g ,, Bars (best selected)... ... per ton	£75	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£43 15s.	—
d ,, ,, Wire Rods ... ,,	£48 15s.	—
d ,, ,, H.C. Wire ... per lb.	7¾d.	—
f Ebonite Rod ¼" dia. & up ... ... ,,	1/10 to 2/5	—
f ,, Sheet ⅛" thick & up ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12... ,,	2/4	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	6d.	¼d. dec.
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i ,, Wire galv. No. 1 P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£17 15s.	15s. inc.
g Mercury ... ... per bot.	£12 17s.	—
e Mica (in original cases) small ... per lb.	10d. to 2/–	—
e ,, ,, ,, medium ... ,,	6/– to 12/6	—
e ,, ,, ,, large ... ,,	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1/1¼	—
p ,, ,, rolled strip & sheet ,,	10¾d.	—
p ,, ,, wire ... ... ,,	1/0½	¼d inc.
o Platinum ... ... per oz.	£7	—
d Silicium Bronze Wire ... ... per lb.	8½d.	—
g Spelter ... ... per ton	£14 16s. 3d.	16s. 3d. inc.
g Tin, Block (English)... ... ... per ton	£187	£8 5s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/3	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

B.I.F. Notes

British Thomson-Houston sound-amplifying equipment is again being used at the British Industries Fair, Castle Bromwich, for amplifying the speeches made at the special luncheons held in the Bradford, Royal and Conference rooms. This year 10-W amplifiers of the latest type are being used. These are suitable for rack-mounting or for use as separate units, require no pre-amplifier, and provide a polarising voltage when carbon-type microphones are employed. The microphones are of the moving-coil pattern. Curved cone-type A143 B permanent-magnet speakers, mounted in cabinets, are installed. These units have an excellent frequency characteristic and possess a sensitivity usually associated with an energised type of speaker.

Johnson, Matthey & Co., Ltd., have issued a folder in colour, being a guide to the company's exhibits at the Fair in London and Birmingham.

The stand number of the electrical exhibit at Birmingham of Bratt Colbran, Ltd., is Cb.212. The number given in our last issue (Ca.604) relates to the company's stand in the Gas Section.

"Diamond H" Switches, Ltd., has prepared a special brochure in colour which it is distributing from its stand during the British Industries Fair at Birmingham. This illustrates some of the many applications of the company's switches.

Blackburn Showroom Extensions

The picture of the demonstration theatre at the extended Blackburn showrooms which we reproduced in our last issue showed it in an unfurnished state. We hope to publish further views of the new premises in an early issue.

Trade Announcements

With reference to the registration of the Gooding Electrical Co., Ltd., which was recorded in our issue of February 11th, we are informed that the registered office of this company is at 7, Kenton Street, Russell Square, London, W.C.1.

The name of the Crystalate Gramophone Record Manufacturing Co., Ltd., has been changed to Crystalate, Ltd. The London office is at Moorgate Hall, 153, Moorgate, London, E.C.2 (telephone: Metropolitan 5574), and the works at Golden Green, near Tonbridge, Kent (telephone: Hadlow 33 and 62).

The telephone number of the Lightfoot Refrigeration Co., Ltd., has been changed to Perivale 3322/8.

The new telephone number of Marelli & Co., Ltd., is Abbey 5476 and not 5478 as reported in our last issue.

On Monday next the Glasgow office of David Brown & Sons (Hudd.), Ltd., will be transferred to 29, St. Vincent Place, Glasgow, C.1 (telephone, Central 3282; telegraphic address "Gearingly").

Fire at Witton

The General Electric Co., Ltd., states that a fire which occurred at its Witton Engineering Works, Birmingham, on February 19th, was confined to one of the stores buildings containing accessories, separated from the main groups of works by the Tame Canal. Thus the production facilities of the works are unimpaired, and manufacturing operations are proceeding quite normally.

New Catalogues and Lists

Willmot Trucks & Products, Ltd., Ivanhoe Truck Works, Scotts Green, Dudley.—A booklet illustrating hand trucks of all kinds.

Cressall Manufacturing Co., Ltd., Eclipse Works, 31-32, Tower Street, Birmingham, 19.—A list describing shunt-field regulators for motors, generators and alternators.

Catalin, Ltd., 3, Vere Street, London, W.1.—A well-illustrated art booklet dealing with the company's new synthetic resin.

Franco-British Electrical Co., Ltd., 25/27, Oxford Street, London, W.1.—An 8-page pictorial newspaper called the "Franco-Signs Pictorial."

Pump Unit, Ltd., 25, Coptic Street, London, W.C.1.—A catalogue of oil-hydraulic unit pumps.

Bulpitt & Sons, Ltd., Swansea Works, Birmingham, 1.—A complete 71-page illustrated catalogue of "Swan" brand domestic products.

Davidson & Co., Ltd., Sirocco Engineering Works, Belfast.—Publication No. S.F.66, a 42-page illustrated technical booklet dealing with flue-dust collectors.

B.T.H. Co., Ltd., Crown House, Aldwych, W.C.2.—A price list of "Mercra" lamps and equipment for discharge lighting.

Carrier Engineering Co., Ltd., 24, Buckingham Gate, London, S.W.1.—A leaflet, "Air Raid Precautions in the Home," dealing with a gas filtration unit.

English Electric Co., Ltd., Stafford.—A brochure containing illustrations of many of the company's varied products.

Private Arrangements

H. Freedman, trading as Henfrey Radio and Edgware Shade Co., 113, Burnt Oak Broadway, Middlesex, and branches.—A meeting of the creditors was held on February 16th at Winchester House, Old Broad Street, London, E.C. Mr. F. E. Bendall, of Bendall, Poppleton & Appleby, who represented the principal creditors, was elected to the chair. Levy, Hyams & Co., submitted a statement of affairs which showed liabilities of £7,045. The total assets were £5,291, leaving a deficiency of £1,754. A resolution was passed in favour of the matter being dealt with under a deed of assignment to Mr. F. E. Bendall and Mr. N. W. Osborne. A committee was also appointed consisting of the representatives of Midland Auto Components, the General Electric Co., Ltd., and the Wholesale Fittings Co., Ltd.

Metropolitan Engineering Co., 658, Seven Sisters Road, London, N.15, wireless dealers, &c.—At a meeting of the creditors Mortimer O'Mahony & Co., accountants and auditors, 199, Piccadilly, London, W., submitted a statement of affairs which showed liabilities of £1,015, all due to the trade. The net assets were £61, leaving a deficiency of £954. An offer was submitted of a composition of 1s. 6d. in the £, to be paid within three months and secured. That offer was not accepted, and after some discussion it was increased to 2s. 6d. in the £, in addition to any sum which might be realised from the assets shown on the statement of affairs. The creditors decided that the amended offer should be accepted and that the matter should be carried through by Mr. M. O'Mahony, as trustee, with a committee consisting of British Tungsram Radio Works, Ltd., the Edison Swan Electric Ltd., and A. C. Cossor, Ltd.

R. H. J. Martin, 27, Staplehurst Road, Hither Green, S.E.13, and 480, Green Lane, Eltham, S.E.9, radio and electrical dealer, &c.—At a meeting of the creditors it was stated that the liabilities due to unsecured creditors totalled £1,237, and there was a claim by the landlord amounting to £17. The net assets were £337, leaving a deficiency of approximately £900. It was stated that the stock consisted largely of accessories and components and an offer of £75 had been received for it. Resolutions were passed confirming the deed of assignment already executed to Mr. H. G. W. Gibson, Aldwych House, Aldwych, London, E.C., and a committee was also appointed.

Bankruptcy Proceedings

J. H. Dollittle, radio engineer, 35, Queen's Road, Farnborough, Hants.—Receiving order made February 9th on debtor's own petition.

W. F. Buttery, electrical contractor, 34, Holme Lane, Dudley Hill, Bradford, lately trading at 293, Tong Street, Dudley Hill, Bradford.—Public examination March 10th at the County Court, Manor Row, Bradford.

G. F. D. Leech, electrician, "Neon," Plumstead Road, Thorpe St. Andrew, Norfolk, lately trading at Cleveland, Oulton Road, Lowestoft.—Receiving order made February 9th on debtor's own petition. Public examination March 15th at the Shirehall, Norwich.

A. C. E. Applin (Applin & Burt), electrical engineer, 110, St. Mary's Road, Southampton.—Application for discharge to be heard on March 15th at the Court House, Southampton.

J. C. De Wardt (De Wardt Radio), radio and electrical engineer, 10, Windmill Street, Gravesend.—Last day for receiving proofs for dividend March 7th. Trustee, Mr. A. H. Partridge, 3, Warwick Court, Gray's Inn, W.C.1.

A. F. Webb, electrician, Ashdown, Regents Road, St. Helens, formerly trading at 102, Duke Street, St. Helens.—Supplemental dividend of 16s. 7¾d. in the £ and 4 per cent. statutory interest, payable February 25th at Government Buildings, Victoria Street, Liverpool.

J. V. Wilson, electrical contractor, 20, High Street, Bromsgrove.—First and final dividend of 1s. 11½d. in the £, payable February 28th at Midland Chambers, Warwick Passage, Corporation Street, Birmingham.

Company Liquidations

Parolle Electrical Plant Co., Ltd.—Winding up voluntarily for reconstruction purposes. Liquidator, Mr. J. M. Smith Coates, 31, Mosley Street, Newcastle-upon-Tyne.

The registration of a new company with the same title is recorded in our "New Companies" section to-day. As we announced in our last issue the new company has been formed with an authorised capital of £100,000 to be subscribed by C. A. Parsons & Co., Ltd., and A. Reyrolle & Co., Ltd., equally, to take over the whole of the contracting and general business of the company which has now gone into voluntary liquidation for the purposes of reconstruction.

Ridgelite Electric Co., Ltd., 49, Bedford Row, W.C.—Creditors and shareholders met on February 16th at the offices of the Board of Trade, Carey Street, W.C. The Official Receiver reported that the statement of affairs showed liabilities of £7,990 against assets of £20. The company was formed in October, 1933, with a nominal capital of £500 to carry on business as dealers and manufacturers of electric lamps and electrical goods. One of the directors attributed the failure to the fact that a Coronation novelty called "Litbadge" met with little demand from the public, partly owing to the fact that the company refrained from canvassing the large stores. The liquidation of the company was left in the hands of the Official Receiver.

Scott's Radio Houses, Ltd., 125, Essex Road, London, N.1.—The statutory meeting of creditors was held on February 17th at the offices of Percy Mason & Co., C.A., 64, Gresham Street, E.C.2. It was reported that the shareholders had previously met and passed resolutions for voluntary liquidation, and had nominated Mr. L. C. E. Webber, of Percy Mason & Co., as liquidator of the company. A statement of affairs as at January 12th last was submitted which showed liabilities of £6,158. The net assets available for the unsecured creditors, subject to realisation, were £343, and there was a deficiency so far as they were concerned of £5,815. The issued share capital of the company was £4,700, and the total deficiency as regarded contributories was £10,514. The creditors passed a resolution confirming the voluntary liquidation of the company with Mr. Webber, and Mr. C. Latham, 185, High Holborn, W.C.1, as joint liquidators of the company, with a committee of inspection consisting of the representatives of five of the creditors.

Norwich Wireless Co., Ltd.—Winding up. Liquidators, Mr. C. Latham, 185-188, High Holborn, W.C.1, and Mr. G. R. Lowe, River Plate House, Finsbury Circus, E.C.2.

West of England Supply Companies.—The *London Gazette* announces that the following companies are being wound up voluntarily:—Cirencester Electric Supply Co., Ltd.; Abingdon Electric Supply Co., Ltd.; West Wilts Electric Light & Power Co., Ltd.; and the Wantage Electric Supply Co., Ltd. The liquidator is Mr. E. J. Harrison, 11, Waterloo Place, S.W.1, to whom particulars of claims must be submitted by March 21st.

Cookham and District Electricity Corporation, Ltd.—Winding up voluntarily. Liquidator, Mr. E. G. F. Cartwright, 15, York Buildings, Adelphi, W.C.

Electricity Supply

Lighting, Domestic, Power

Accrington.—SUB-STATION.—The Town Council is to build a sub-station at Knuzden.

Blairgowrie (Perthshire).—STREET LIGHTING.—On February 18th a system of street lighting by high-pressure mercury-vapour electric-discharge lamps, installed by the General Electric Co., Ltd., was inaugurated at the Wellmeadow.

Blaydon-on-Tyne.—INQUIRY.—A Ministry of Transport inquiry is to be held into the refusal of the Urban District Council to allow overhead lines to be erected in certain localities by the North-Eastern Electric Supply Co., Ltd.

UNDERGROUND CABLE.—The supply company is to lay a 20-kV underground cable from Scotswood-Shotley Bridge Road to Ladysmith-Rowlands Gill.

Bolton.—SODIUM LIGHTING.—The sodium-lighting system has recently been extended. The accompanying illustration shows Chorley Old Road, where 150-W "Philora" lamps supplied by Philips Lamps, Ltd., are used in fittings manufactured

Sodium lighting in Chorley Old Road, Bolton

by the Revo Electric Co., Ltd. Similar lighting is provided in Manchester Road. The installations were designed and carried out under the supervision of Mr. H. Hamer, the Corporation lighting engineer.

Canada.—BILL TO RESTRICT EXPORT OF POWER.—A Bill which the Prime Minister recently introduced in the Canadian Parliament provides that no further licence for the export of hydro-electric power shall be granted except by special Act of Parliament. The Bill will not affect existing licences or the Government's power to renew or cancel them.

ELECTRICITY GENERATION IN 1937.—Central electric stations in Canada produced 27,575 million kWh in 1937, as against 25,394 million kWh in the previous year. Consumption of electrical energy in Canada rose from 23,816 million kWh in 1936 to 25,728 million kWh in 1937, and exports to the United States increased from 1,578 million kWh to 1,847 million kWh.

HYDRO-ELECTRIC SCHEME.—The *Montreal Gazette* reports an announcement by the Provincial Electricity Board of Quebec that the St. Maurice Power Corporation (jointly owned by the Shawinigan Water and Power Co. and the Brown Corporation) has made application for permission to construct a hydro-electric power plant on the St. Maurice River at La Tuque. The estimated cost of this undertaking, with an installed capacity of 162,000 h.p., is $12,500,000. Preliminary work has been proceeding during the past six months in accordance with the terms of an order issued last July by the Quebec Electricity Commission. The plant is to consist of a dam and a power house with four hydro-electric generating units, each having an installed turbine capacity of 40,000 h.p. when operating under a head of 104 ft. Alternative construction programmes, covering periods of three or four years, are being considered.

Carlisle.—MAINS.—The Corporation is to extend its mains in the city area at a cost of £1,078, and in the rural area at a cost of £1,268.

LOANS.—It is proposed to borrow £20,000 for mains, £5,483 for extensions at Scaleby Hill and £12,336 for rural extensions.

Ceres (Fifeshire).—ELECTRIC LIGHTING.—Lighting standards are to be erected in the streets of the village at a cost of £95.

Chester.—BETTER LIGHTING.—The Watch Committee has authorised the electrical engineer to proceed with a scheme for improved lighting in Parkgate Road. The cost will be £900.

Chichester.—METERS.—The Town Council is applying for permission to borrow £5,000 for meters.

Clitheroe.—PROPOSED REBATE.—The Electricity Committee has put forward a proposal to grant a rebate of 2s. per quarter on the fixed charge made under the all-in tariff providing a cooker or water heater is installed and the consumption exceeds 250 kWh a quarter.

Croydon.—STREET LIGHTING.—Sodium lighting is to be provided in Croham Road at a cost of £1,318. For street lighting generally, the Electricity Committee is applying for permission to borrow £25,000.

Exeter.—ADDITIONAL BULK-SUPPLY CABLES.—In 1930 two bulk-supply feeder cables were laid from the Corporation's power station to the Sowton sub-station of the Exe Valley Electricity Co., Ltd., in order to provide a bulk supply. Owing to the increase in load it is now necessary to lay a third cable. As the Corporation proposes to lay a cable from the power station to its sub-station at Heavitree Gallows, the company is to take advantage of the opportunity to have a cable laid in the same trench.

SUB-STATION.—Sanction is being sought by the Electricity Committee to borrow £7,500 for sub-station equipment, plant and kiosks.

Fleetwood.—BOWLS BY FLOODLIGHT.—Experiments are being carried out in the floodlighting of the bowling green to enable play to be carried on until midnight and the season extended to October.

France.—NEW 150-KV TRANSMISSION LINE.—The Société de Transport d'Energie de l'Ile-de-France has recently been authorised to proceed with the establishment of a 150-kV transmission line between sub-stations at Damery (Marne Department) and Creney (Aube), a distance of about 55 miles. The line will comprise three aluminium-steel conductors capable of transmitting 45,000 kW.

Frizington (Carnforth).—PROPOSED SUPPLY.—The Mid-Cumberland Electricity Co., Ltd., is laying underground cables in order to afford a supply of electricity to the district.

Glasgow.—ECONOMICAL ELECTRIC HEATING.—The city engineer has reported that the heating and domestic hot-water services in the extension to Hawkhead Mental Hospital have now been in operation for a full working year. As a result of records kept it has been ascertained that during the whole of last winter the inside temperature of the nurses' home averaged from 60 deg. to 63 deg. F. and never fell below the former figure, this temperature being maintained without recourse to the thermal-storage supply provided to meet the demand for hot water during the peak periods when the electricity supply is cut off. The estimated amount of electricity required for the whole of the extension was 3,510,000 kWh and the actual consumption was 2,130,870 kWh, the running cost being £1,824 less than the estimate (£4,488).

FIRE-ALARM EQUIPMENT.—The Health Committee has authorised the M.O.H. to arrange with the Electricity Department for the installation of a new fire-alarm system at the Southern General Hospital at an approximate cost of £824.

Municipal Supply Undertakings' Results

Town.	Engineer.	Total Revenue.		Working Expenses.		Net Profit.		Sales of Electricity. Thousands of kWh.		% Increase.
		1935/36.	1936/37.	1935/36.	1936/37.	1935/36.	1936/37.	1935/36.	1936/37.	
		£	£	£	£	£	£			
Accrington	A. W. Clegg	106,592	116,851	55,865	59,146	18,717	24,055	32,909	36,815	8.4
Bethnal Green	E. E. Jolly	124,151	125,001	63,354	75,151	26,821	23,066	14,921	16,283	8.1
Cheltenham	W. J. Bache	106,480	109,303	78,220	84,402	5,730	5,738	11,950	13,085	10.4
Colchester	G. P. Dixon	148,214	158,947	85,668	96,459	7,539	6,480	18,393	20,740	12.2
Croydon	F. N. Rendell-Baker	495,603	516,552	116,293	140,034	60,786	40,251	99,794	112,484	12,7
Harrogate	N. McLean	135,842	149,727	74,462	81,903	21,629	23,892	19,321	21,806	13.3
Lytham St. Annes	J. C. Fairchild	92,701	101,397	49,870	50,342	2,986†	3,771	12,467	14,399	15.5
Morecambe and Heysham	P. Clegg	74,009	77,340	37,730	38,937	9,663	12,732	10,319	11,955	15.9
Nelson	T. Dawson Martin	85,366	91,030	80,356	84,233	4,292	6,797	17,089	19,116	11.9
Newark	R. E. Livesley	33,367	36,888	20,220	26,416	8,570	5,677	7,248	10,054	38.7
Newcastle-under-Lyme	A. J. C. DeRenzi	31,814	33,056	17,882	20,740	1,629	2,837	3,461	4,207	24.6
Shoreditch	A. Weeks*	202,873	217,204	102,388	111,666	7,453	19,344	33,284	35,580	6.9
Wimbledon	A. E. McKenzie	285,974	328,764	193,749	204,918	25,285	35,273	60,042	68,852	14.7

* Since retired. † Loss.

Hull.—CABLES.—The Electricity Committee is applying for permission to borrow £54,800 for cables.

Kent.—X-RAY PLANT.—The County Council is to provide new X-ray plant at the Lenham Sanatorium at a cost of £1,000.

ELECTRICITY IN A SCHOOL.—The County Education Committee is to renew the electrical installation at the West Hill School, Dartford.

Leicester.—STREET LIGHTING.—Owing to the extension of the city boundaries the Watch Committee will require £6,000 extra for lighting next year.

Lochgelly (Fife).—COMPENSATING TENANTS.—Following its approach to the Secretary of State for Scotland, the Town Council is still faced with the problem of how to obtain legal authority to pay compensation to a number of Council tenants who installed electric lighting in their houses at their own cost. A test case is suggested as a means of finding a solution. The Secretary of State, replying to a letter from the local M.P., said that the matter was a question of law, and if he were to attempt to give a ruling it would create a dangerous precedent, for it would be unauthoritative. The only circumstances under which he could give a ruling would be on receiving an interim report from the burgh auditor dealing with expenditure already incurred. Before paying compensation in one instance and making a test case, the Council is to ask the Secretary of State for his opinion.

The stand of the London Electric Wire Co. & Smiths, Ltd., at the British Industries Fair. The background feature shows cotton-covered and plain copper braids coming from a silhouette of the company's factories and being actually wound on to eight drums

London.—BATTERSEA.—The Electricity Committee proposes to change a further portion of the borough from d.c. to a.c., *viz.*, part of St. John's Ward north of St. John's Hill, Winstanley Ward (except Falcon Road, Musjid Road and Kambala Road), remainder of Church Ward except the area between Shuttleworth Road and Battersea Park Road, and the area bounded by Battersea Rise, Northcote Road, Shelgate Road and Battersea Rise Cemetery. There are approximately 6,355 consumers in these areas to be changed over. The estimated cost of the scheme is: Low-voltage feeders, £11,400; transformer station, £750; transformers and switchgear, £1,940; changing consumers' apparatus, &c., £17,924; and new meters, £14,026. The Committee is also to provide services to 64 premises at a cost of £468. The Electricity Commissioners have authorised the borrowing of £25,000 for mains, sub-stations and equipment.

STOKE NEWINGTON.—The Electricity Committee has given consideration to the question of the use of radiant hot-plates on new and old electric cookers in substitution for the solid type of plate, and a number of cookers have been installed with this type of plate when the solid plate has failed. Consumers whose cookers have been installed with radiant hot-plates are very satisfied, and the Committee is of opinion that all solid plates should be replaced as and when they fail by radiant hot-plates which, it is considered, will greatly assist in the development of the Council's cooker scheme.

ST. PANCRAS.—In June last in consequence of the increasing development of a.c. supplies distributed from the Arlington Road sub-station, authority was given for the immediate installation of additional high-voltage switchgear. The chief electrical engineer now reports that the provision of additional low-voltage switchgear consisting of a fifteen-panel switchboard is now essential. The estimated cost of the equipment, including erection, is £3,000. In order to meet the need for a.c. supplies in the Primrose Hill district it is proposed to re-equip an underground chamber in Fitzroy Road which was originally used by the Department as a balancing sub-station, but has since been placed at the disposal of the Highways Department. The estimated cost of adapting and equipping the premises is £7,309.

Manchester.—ANNUAL ESTIMATES.—During the forthcoming financial year the Electricity Committee budgets for an expenditure on capital account of £648,000. Of this sum £270,000 is for generating stations, £97,000 for transforming and distributing stations, stores, &c., £273,000 mains and services and £8,000 street lighting. Income from the sale of electricity is estimated at £2,160,000, representing an increase of £89,000 on the year now concluding.

Mexico.—NEW HYDRO-ELECTRIC PLANT.—Tentative plans for a new hydro-electric plant have been announced by the Federal Electrical Commission. Development of a site at Ixapantongo, in the Rio Bravo valley, would provide an initial 15,000 h.p. and, with two further units to be installed later, 80,000 h.p.

Middlesbrough.—DEVELOPMENT PLANS.—Expenditure which the Town Council proposes to incur on its electricity undertaking during 1938-9 includes £48,199 for mains and sub-station equipment, £8,000 for services and £5,000 for meters.

Montrose.—POWER STATION.—A petition by the Grampian Electricity Supply Co. for permission to erect a power station has been granted by the Dean of Guild Court.

Newcastle-on-Tyne.—ELECTRICITY IN COUNCIL HOUSES.—A £50,000 scheme recommended by the Housing Committee for installing electricity in all Council houses not already supplied has been referred back by the Town Council.

Newcastle (Staffordshire).—EXTENSIONS.—Extensions of the electricity mains in Shaw Street, Dartmouth Avenue, Silverdale and Chesterton have been approved by the Corporation.

Oxford.—COMPANY'S OFFER REJECTED.—The City Council on Monday decided to inform the Wessex Electricity Co. that it was not prepared to accept the company's offer to purchase the Council's electricity undertaking.

Palestine.—ELECTRICITY AT TEL AVIV.—Electric power, instead of the originally proposed Diesel engines, is to be used by the Tel Aviv Municipality to pump an additional supply of water into the city from Ras-el-Ain, a series of springs 20 miles distant. The Palestine Electric Corporation, Ltd., is to undertake the work.

Pegswood (Northumberland).—LIGHTING SCHEME.—A public meeting has given authority to the Parish Council to proceed with an electric lighting scheme for the village at a cost of about £800.

Penrith.—ELECTRICITY IN COUNCIL HOUSES.—Permission has been granted to the Penrith Electric Supply Co., Ltd., to install electricity in 52 Council houses.

Poland.—INCREASED OUTPUT.—The output of the electric power stations at Dombrowa, Cracow and Warsaw and those known as the Brelsko-Biala and Silesia, controlled by the Trust Metallurgique-Electrique et Industriel, of Brussels, amounted to 240 million kWh last year, as compared with 190 million kWh in 1936, an increase of 26 per cent.

Portsmouth.—MAINS.—The Electricity Committee is to extend its mains at a cost of £1,200 to an estate at Waterlooville.

SUB-STATION.—A site has been acquired by the Committee in Cornaway Lane, Portchester, for the erection of a sub-station.

Preston.—LOANS.—Application is being made by the Electricity Committee for permission to borrow £150,000 for mains and services, £25,000 for meters and £75,000 for domestic apparatus to be let out on hire. It is also proposed to apply for an Order authorising the Committee to supply electricity to the Fylde Water Board at Westby Reservoir at a cost of £3,295.

Retford.—SUPPLY AT EAST DRAYTON.—A supply of electricity has been made available at East Drayton by the Retford Corporation electricity undertaking, which now has forty-eight villages with electricity in its area.

Sedgley.—NO ELECTRICITY FOR COUNCIL HOUSES.—The suggestion of the development engineer of the Midland Electric Corporation for Power Distribution, Ltd., that the Council should consider the installation of electricity in all of its houses at a cost of £6 per dwelling, to be recovered by an appropriate increase in rent, has not been entertained.

Soviet Union.—UNDERGROUND HYDRO-ELECTRIC STATION.—In the Kola peninsula work is to begin this year on the construction of an underground hydro-electric station on the River Niva, to be known as the "Niva 3," reports *Reuter's Trade Service* from Moscow. The river water, held up by a dam, will be sent through a subterranean tunnel about 3 km. long from which it will flow into an open canal. From there it will run through pipes to the power station which will be installed underground at a depth of 45 to 80 m. Thence the

water will pass through a second tunnel 2,800 m. long into a second open canal, which will carry it into the White Sea. The capacity of the station will be 150,000 kW. High-voltage transmission lines will connect with "Niva 2" and with the Tulomges station.

Tredegar.—LOANS.—The Urban District Council is applying for permission to borrow £3,000 for meters and £2,000 for assisted wiring.

West Hartlepool.—METER TESTING EQUIPMENT.—Application is to be made by the Town Council for sanction to borrow £1,465 for meter testing equipment.

Traction

Great Western Railway.—ELECTRIFICATION SCHEME.—The Great Western Railway Co. announces that, in view of the increasing cost of steam working, Messrs. Merz and McLellan have been requested to prepare a scheme for the electrification of a part of its system. It is thought that the substitution of electric traction may effect considerable economies.

It was revealed by Lord Horne, the chairman, at Wednesday's meeting of the company, that the section of the system for which the scheme was to be prepared was that between Taunton and Penzance, a distance of 162 miles.

Southampton.—DISCONTINUANCE OF RATE CONTRIBUTION RECOMMENDED.—A recommendation has been made to the Council by the Transport Committee that the policy of contributing to the rates by the Department shall be discontinued. It is contended that profits should be conserved for the gradual conversion of the system. The contribution by the Department during recent years, it is stated, has amounted to between £165,000 and £170,000.

United States.—RAILWAY SPEEDS.—Writing on "Railway Speed Developments in 1937," in the *Railway Gazette*, Mr. C. J. Allen states that most of the fast running with electricity is monopolised by the electrified lines of the Pennsylvania Railroad between New York, Philadelphia, Baltimore, and Washington. The inter-urban Chicago, North Shore and Milwaukee electric line, with its numerous stops and short runs, has two 15-mile runs booked at 75 m.p.h. from start to stop, but these are hardly practical, and any loss of time so occasioned is probably recouped on the next succeeding section. Twenty-six American runs are quicker than the fastest in Germany (66.9 m.p.h.), where the high-speed Munich-Augsburg-Stuttgart service has been slowed down since 1936; immediately after the quickest German runs comes the fastest in France with electric haulage, of the Paris-Orleans Sud express between Paris (Quai d'Orsay) and St. Pierre-des-Corps (66.8 m.p.h.). This run includes the usual slow travelling between Quai d'Orsay and Austerlitz, and also a conditional stop at Les Aubrais. The aggregate electric high-speed mileage (62 m.p.h. and over) in the U.S.A., France, Germany, Italy and Switzerland in 1937 was 12,585. This was equal to 17 per cent. of the total steam, Diesel and electric high-speed mileage, representing a slight advance as compared with the previous year.

TWO-TIER ELECTRIC COACHES.—Two new electric coaches recently put into service on the Long Island Railroad have seats in two tiers. There is a centre aisle from which passengers step down to the lower tier and up to the upper. By this space-conserving construction increased seating capacity is achieved without exceeding the limits of height imposed by the requirements of safe clearance in passing under bridges and through tunnels. One of the new cars is equipped with four high-speed electric motors, two at each end, and the other, though characterised as a trailer, is equipped with motor control so that the motorman may operate from either end of the double unit.

Communications

Canada.—RADIO LICENCE FEE RAISED.—The Ottawa correspondent of the *Montreal Gazette* reports an announcement by the Hon. C. D. Howe, Minister of Transport, that during the next fiscal year radio receiving licence fees will be raised from $2 to $2.50. The new regulations will provide that a separate licence will be required for each receiving set, and the present arrangement that permits a single licence to cover more than one set in a single dwelling and in an automobile will no longer apply. It is anticipated that an additional net revenue of $650,000 per annum will result from the new regulations and that the revenue available to the Canadian Broadcasting Corporation during the next fiscal year will be approximately $2,575,000 from this source. Mr. Howe stated that the increased revenue would enable the C.B.C. to carry out its programme of service improvements. The Minister said that to extend the broadcasting service to all parts of Canada the Corporation must look to revenue from licence fees for its main financial support. Responsibility for public service broadcasting made it desirable to limit the commercial activities of C.B.C. to within reasonable limits.

TRANSATLANTIC TELEPHONE SYSTEM.—Traffic over the direct Montreal-London telephone channel during 1937 increased by about 55 per cent., averaging seven calls per day.

Great Britain.—RADIO RELAYS.—Last week the Works Committee of the Southampton Town Council recommended that the proposed arrangement with the Post Office for the establishment of a radio relay system in Southampton should be approved and consent given to the laying of cables in 175 roads. In moving the recommendation Alderman Mouland surveyed the negotiations which had taken place with radio dealers in the town and radio relay companies, since the question of providing a system was first suggested in 1930. Last year the Telecommunications Department of the G.P.O. had replied to the Town Clerk that it would not be practicable to give a guarantee asked for by Broadcast Relay Services or to undertake to pay compensation, but that if it was desired the P.M.G. would select Southampton for examination as to its suitability for a trial of the system. Since then the matter had been gone into very thoroughly by the Works Committee. Alderman Mouland pointed out that the Post Office had powers enabling it to lay cables in the streets whether the Council agreed or not. Alderman Chick moved an amendment that no further action should be taken in the matter. He objected to Government competition with private enterprise and initiative, and said that if the Post Office relay service in Southampton were completely successful it would result, it was estimated, in a loss to the town of about £4,000 a year in rates from local traders, £25,000 a year in electricity consumption, and £30,000 a year in loss of wages through unemployment. The debate lasted nearly two hours, and the amendment was carried by thirty-four votes to twenty-three.

Forthcoming Events

Institution of Electrical Engineers.—Monday, February 28th. Institution, London, W.C.2. 7 p.m. Discussion on "The Widening Scope of Electrical Meters and Instruments." To be opened by Mr. G. F. Shotter.

Wireless Section.—Wednesday, March 2nd. Institution, London, W.C.2. 6 p.m. "A Quantitative Study of Asymmetric Sideband Broadcasting." Mr. P. P. Eckersley.

Meter and Instrument Section.—Friday, March 4th. Institution, London, W.C.2. 7 p.m. "The Use of the High-Vacuum Cathode-ray Tube for Recording High Speed Transient Phenomena." Capt. D. I. McGillewie. "Recurrence Surge Oscillographs and Their Application to Short Time Transient Phenomena." Mr. K. J. R. Wilkinson.

Hampshire Sub-Centre.—Friday, February 25th. Kimbell's Café, Southsea. Annual conversazione and dance.

North-Eastern Centre.—Monday, February 28th. King's College, Newcastle-on-Tyne. 6.15 p.m. "Line Protection by Petersen Coils." Messrs. H. Willott Taylor and P. F. Stritzl.

Western Centre.—Monday, February 28th. Electricity Showrooms, Exeter. "The Use of Protective Multiple Earthing and Earth-leakage Circuit Breakers in Rural Areas." Mr. H. G. Taylor.

North Midland Centre.—Tuesday, March 1st. Hotel Metropole, Leeds. 7 p.m. "The Moving-Coil Voltage Regulator." Mr. E. D. T. Norris.

Friday, March 4th. Hotel Metropole, Leeds. 7 p.m. Annual dinner.

North-Western Centre.—Tuesday, March 1st. Engineers' Club, Manchester. 7.15 p.m. Cooker papers by Messrs. O. W. Humphreys and J. N. Waite.

East Midland Sub-Centre.—Tuesday, March 1st. Electricity Showroom, Derby. "The Lighting Load—Its Characteristics and Development." Mr. W. J. Jones.

British Electrical Development Association.—Monday, February 28th. Midland Hotel, Manchester. 12.45 p.m. N.W. England Area luncheon.

Junior Institution of Engineers.—Friday, February 25th. Princes Galleries, Piccadilly. 6.45 for 7.15 p.m. Institution dinner.

Friday, March 4th. 39, Victoria Street, London, S.W.1. 7.30 p.m. Informal meeting. Lecture on "Water Turbines." Mr. W. J. Kennelly.

Institute of Marine Engineers.—Friday, February 25th. Connaught Rooms, London, W.C.2. Annual dinner.

Association of Supervising Electrical Engineers.—Saturday, February 26th. Trocadero Restaurant, London, W.1. Annual dinner and re-union.

Western Area.—Monday, February 28th. Royal Hotel, Bristol. 7.30 p.m. Illustrated lecture on "Modern Industrial Lighting." Mr. L. M. Tye.

Nottingham Society of Engineers.—Monday, February 28th. The Welbeck Hotel, Nottingham. 7.30 p.m. Joint meeting with the Institution of Electrical Engineers (*East Midland Sub-Centre*). "Failures of Electrical Plant." Mr. R. G. Maxwell.

Birmingham Electric Club.—Monday, February 28th. Grand Hotel, Birmingham. 7 p.m. "Electrical Services in a Large Stores." Mr. O. C. Waygood.

Friday, March 4th. Grand Hotel. 6.30 p.m. Annual dinner.

Institution of Automobile Engineers.—Tuesday, March 1st. Institution of Civil Engineers, Great George Street, S.W.1. 7 p.m. Joint meeting of the Institution of Electrical Engineers and kindred societies. Papers on "Essential Road Conditions Covering the Safety of Modern Traffic."

Illuminating Engineering Society.—Tuesday, March 1st. Institution of Mechanical Engineers, Storey's Gate, S.W.1. 6.30 for 7 p.m. Joint meeting with the Institution of Heating and Ventilating Engineers. "Illumination Levels and Comfort Conditions as applied to the Lighting, Heating, and Ventilating Problem." Mr. F. C. Smith.

British Electrical Development Association (*Northern Counties Area*).—Thursday, March 3rd. Newcastle-on-Tyne. Annual meeting and luncheon.

Institution of Engineers-in-Charge.—Friday, March 4th. Holborn Restaurant, London, W.C.2. Annual dinner.

Leipzig International Industries Fair.—Sunday, March 6th, to Monday, March 14th.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdare.—March 14th. Electricity and Transport Department. Apparatus and equipment for the establishment of a "Class A" meter-testing station. (February 18th.)

Aberystwyth.—March 15th. Electricity Department. Meters for three years. (See this issue.)

Australia.—BRISBANE.—March 30th. City Electric Light Co., Ltd. One electric goods lift. (T.Y. 17341/38.)*
MELBOURNE.—June 29th. Victorian Railway Commissioners. Turbo-alternator and accessories. (T.Y. 17013/38.)*

Aylesbury.—March 1st. Electricity Department. Materials for twelve months. (February 11th.)

Bingley.—March 8th. Electricity Department. Mercury discharge lamps. (February 18th.)

Birmingham.—March 11th. Airport Committee. Installation of electric lighting and power wiring at Municipal Airport Buildings. (February 18th.)
March 18th. Public Assistance Committee. Electric lighting and power installations and fire alarms for Birmingham Infirmary. Town Clerk's Office, Room 11A, Council House (deposit £2 2s.).

Bridlington.—March 7th. Town Council. Batteries for use in conjunction with meter testing equipment. (See this issue.)
March 10th. Stores for one year. (See this issue.)

Brighton.—March 3rd. Corporation. Tramway stores, including two tons of trolley wire and 1,100 tungsten filament lamps. Town Clerk, Town Hall.
March 8th. Electricity Undertaking. Tungsten filament electric lamps for street lighting, and v.i.r. cables for twelve months. (See this issue.)

Bristol.—March 8th. Electricity Department. Joint and fuse boxes, and cables for twelve months. (February 18th.)

Bromley.—March 9th. Electricity Department. L.v., e.h.v., and l.v. pilot cables, and a.c. meters. (February 18th.)

Chelmsford.—March 22nd. County Public Health and Housing Committee. Electrical installation at Broomfield Court Sanatorium. (See this issue.)

Cleethorpes.—March 5th. Electricity Department. Two 250-kVA transformers. (February 18th.)

Croydon.—March 18th. Electricity Department. One cooling tower, culvert, circulating water piping, valves, &c. (See this issue.)

Dartford.—March 26th. Corporation. Meter racks. (See this issue.)

Derby.—March 1st. County Council. Cables, lamps and electrical accessories for twelve months. (February 11th.)

Dover.—March 4th. Corporation. Meters, transformers and cables for twelve months. (February 18th.)

Dublin.—March 1st. Minister for Defence. Electrical supplies for six months to the Military Barracks (including Baldonnel Camp), and the Curragh Camp. Department of Defence.

Dumfries.—March 1st. Town Council. Electrical installations in six houses at Church Street. Town Clerk.
March 5th. Dumfries and Galloway Royal Infirmary. Electrical installation at auxiliary hospital. J. A. Will, secretary and treasurer, 3, Great King Street.

Dundee.—March 16th. Electricity Department. Tower wagon. (See this issue.)

East Dean.—March 7th. R.D.C. One vertical borehole centrifugal type pump and electric motor, complete with accessories, for the waterworks pumping station, Greenbottom, near Cinderford, Gloucestershire. W. E. Blizard (Lemon & Blizard), 25, Victoria Street, S.W.1 (deposit £3 3s.).

Edinburgh.—February 28th. Department of Agriculture for Scotland. Electrical work in houses and steadings in connection with land settlement schemes in Fifeshire, Perthshire, and Kincardineshire. Chief engineer and surveyor, York Buildings, Queen Street (deposit £1 1s.).

Erith.—March 7th. Electricity Department. Electric water-heaters. (February 11th.)

Farnworth.—March 9th. Electricity Department. Stores for twelve months. (See this issue.)

Fife.—February 28th. County Council. Electric lighting installations in forty-eight houses on the Hallbeath estate. County Clerk, County Buildings, Cupar (deposit £1 1s.).

Guildford.—March 14th. Housing Committee. Electrical installation for 120 houses and twenty-six bungalows. (See this issue.)

Hazel Grove and Bramhall (CHESHIRE).—March 3rd. Electricity Department. One 500-kVA transformer. (February 11th.)

Hendon.—March 14th. Corporation. Electrical installation at Woodside Park Junior and Infants' School. (See this issue.)

Ilford.—March 5th. Electricity Department. E.h.v. switchgear. (February 18th.)

India.—BENGAL.—March 15th. Bengal and North Western Railway Co., Ltd. 26,300 tungsten filament lamps. (February 18th.)

Keighley.—March 14th. Electricity Department. Transformers, p.i. and r.i. cables, motors and starters, and metal-clad switchgear for twelve months. Town Clerk, Town Hall.

Leeds.—March 10th. Corporation. X-ray installation at St. James's Hospital. (See this issue.)

Leyton.—March 7th. Electricity Department. Cables for twelve months. (February 18th.)

Lincoln.—March 12th. Electricity Department. Materials for one year. (See this issue.)

Littleborough.—February 26th. Electricity Department. Cables and meters for twelve months. (February 11th.)

Liverpool.—March 18th. Electric Supply Department. Replating of a 744-Ah control battery. (See this issue.)

London.—ISLINGTON.—March 2nd. Borough Council. Exhaust pipes. (February 11th.)
POPLAR.—March 9th. Borough Council. Stores for twelve months. (February 11th.)
STEPNEY.—February 28th. Cables for twelve months. (February 11th.)

Manchester.—March 16th. Corporation Airport Committee. Installation of aerodrome lighting, including equipment, switchgear and cables. (February 11th.)
March 1st. Electricity Department. Ventilating plant for transformer chambers. (February 18th.)
March 11th. 33-kV, three-phase switchgear and low-pressure pipework. (See this issue.)

Middlesex.—February 28th. County Council. Electrical sundries for twelve months and X-ray, &c., requisites for six months.
March 21st. Electrical installation at new County School for Boys, Isleworth. (February 18th.)
March 21st. Electric lighting and power installations for Enfield House Casual Wards. (See this issue.)
March 25th. Electrical installations for proposed new county offices, Uxbridge. (See this issue.)

Middleton.—March 12th. Electricity Department. E.h.v. and l.v. underground cables. (See this issue.)

Newcastle-on-Tyne.—March 10th. Tyne Improvement Commission. One 800-kW rectifier for sub-station at Albert Edward Dock, North Shields. (See this issue.)

Newton-in-Makerfield (LANCS).—U.D.C. March 5th. Equipment, including electric fires for the Isolation Hospital, Clerk of the Council, Town Hall, Earlestown, Newton-le-Willows.

New Zealand.—WELLINGTON.—April 6th. Posts and Telegraph Department. One electric cross-cut saw. (T.Y. 17265/38.)*

Nottinghamshire.—March 8th. Committee of Visitors of Radcliffe-on-Trent Mental Hospital. One 100-kW generating set. Clerk of the Hospital.

Portland.—March 14th. Electricity Department. Stores for twelve months. (February 18th.)

Reigate.—March 14th. Electricity Department. Meter-testing equipment. (See this issue.)

Rhondda.—March 26th. Electricity Department. Materials for twelve months. (February 18th.)

Rhyl.—March 1st. Electricity Department. Materials for twelve months. (February 18th.)

South Africa.—PRETORIA.—March 3rd. Union Tender and Supplies Board. One Diesel engine, two alternators, three switchgear panels, three transformers, one a.c. motor, cable and cable end boxes. (T.Y. 17428/38.)*
March 3rd. One 7½-kW, 110-V, Diesel-engine driven electric lighting plant, complete with switchboard and battery. (T. 17612/38.)*
March 17th. Three oil-engine driven generator sets. (T.Y. 17596/38.)*
JOHANNESBURG.—March 19th. City Council. L.v. cable end boxes. (T. 17427/38.)*

Stoke-on-Trent.—March 9th. Electrical Engineer's Department. Mains and cables and e.h.v. sub-station switchgear for one year. (February 11th.)

Stranraer.—March 5th. Town Council. Electric lighting installation in seventy-eight houses. Town Clerk (deposit £1).

Sutherland.—March 5th. County Council. Electric lighting at a new school at Golspie. County Clerk, Golspie.

Warrington.—March 7th. Electricity Department. Meter-testing equipment. (February 18th.)

West Ham.—February 28th. Town Council. Installation of traffic lights at various junctions in Barking Road, Canning Town. W. L. Jenkins, borough engineer, Town Hall (deposit £1).

West Hartlepool.—March 7th. Electricity Department. Pilot and telephone cable. (February 18th.)

Winchester.—February 28th. City Council. Two electrically driven 6 in. centrifugal pumps, including stand-by oil engine and all electrical equipment. City engineer and surveyor, The Guildhall.

Windsor.—February 28th. Borough Council. Electric lighting installation in 32 houses being erected at Dedworth. F. N. McRae, borough engineer, 16, Alma Road.

Workington.—March 7th. Electricity Supply Department. Meter-testing instruments. (February 18th.)

Worthing.—March 11th. Electricity Department. Meter-testing equipment and e.h.v. and l.v. cables. (See this issue.)

* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Acton.—Finance Committee. Electric lighting and power installation at municipal office extensions:

	£		£
Bective Electrical Co. Accepted	**7,354**	Electrical Installations	7,997
Troughton and Young	7,666	Duncan Watson	7,999
T. Clarke and Co.	7,930	Berkeley Electrical Co.	8,040
Drake and Gorham	7,992	Page and Girling	9,600

Croydon.—Electricity Committee. Recommended. One 7,000-kW turbo-alternator (£17,257).—Met.-Vick. Electrical Co.

Durham.—County Education Committee. Accepted. Electrical installation at the High Clarence Council School (£185).—R. Robson.

Glasgow.—Health Committee. Accepted. Two generating sets at Stobhill Hospital (£75).—Tritonia, Ltd.

Transport Committee. Accepted. Lead covered cable.—Britannic Electric Cable & Construction Co.

Education Committee. Accepted. Electrical work at Carnwadric School (£1,017).—Scottish Co-operative Wholesale Society.

London.—BATTERSEA.—Borough Council. Recommended. Four 500-kVA transformers (£1,160).—British Electric Transformer Co. E.h.v. and l.v. switchgear (£441).—Switchgear & Cowans. Twenty-four lighting standards (£382).—B.T.H. Co.

HACKNEY.—Electricity Committee. Recommended. Plumbers' metal and solder for twelve months (£997).—B.I. Cables. Lead jointing sleeves and electrical jointing material for twelve months.—L. Andrew & Co.

METROPOLITAN WATER BOARD.—Recommended. Pumping machinery at Hampton works (£42,528).—W. H. Allen, Sons & Co. Electrical equipment for the engine room (£525).—G.E.C.

STEPNEY.—Electricity Supply Committee. Recommended. Equipment for the change-over from d.c. to a.c. Four transformer and four feeder panels (£4,085).—A. Reyrolle & Co. Four l.v. circuit-breakers and additional copper connections (£693).—G.E.C. Two distribution boards and six sets of 600-A fuses (£210).—English Electric Co. Four 750-kVA transformers and parallel control for two sets (£2,910).—Ferranti.

Recommended. One complete main switchboard, eighteen distribution boards, and one splitter combination fuse switchboard (£1,230).—English Electric Co.

L.C.C.—Wiring and fittings for the electrical installation in the new ward block at Mile End Hospital:

	£		£
Electrical Installations. Accepted	**3,394**	G. E. Taylor & Co.	4,148
W. J. Furse & Co....	3,800	Jacob, White & Co.	4,157
Read and Partners	3,980	T. Clarke & Co.	4,203
Buchanan and Curwen	4,027	Pinching and Walton	4,316
Malcolm and Allan (London) ...	4,027	F. H. Wheeler & Co.	4,427
Samuel Reed & Sons	4,055	Duncan Watson (Electrical Engineers)	4,498
Alexander Hawkins & Sons ...	4,082		
Atozed (London)...	4,114		

ST. PANCRAS.—Contracts and Stores Committee. Recommended. Arc welding equipment (£204).—English Electric Co.

Recommended. Installation of traffic signals at Prince Albert Road and Albert Terrace (£543 plus cost of maintenance).—Siemens and General Electric Railway Signal Co.

Portland.—Fire Brigade Committee. Accepted. Electric lighting and heating at fire station (£79).—Davis & Hadley.

West Hartlepool.—Town Council. Accepted. Electric cables.—Britannic Electric Cable Co.; Ismay Cables.

Weymouth.—Housing Committee. Accepted. Electrical installations in Council houses: W. O. Knell (£860); Bennett & Escott (£120); Davis & Hadley (£70).

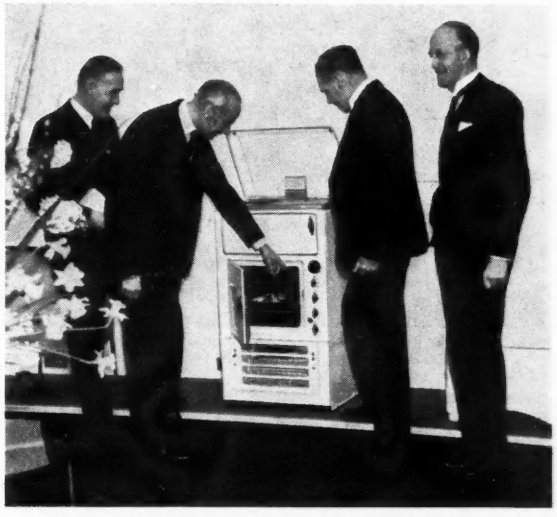
Notes

E.D.A. Luncheon at Bristol

The annual luncheon of the S.W. England and S.W. Area of the British Electrical Development Association was held at the Royal Hotel, Bristol, on Tuesday, the chairman of the area (Mr. H. F. G. Woods) presiding. Proposing the toast of "E.D.A.," Lord Pentland said that the growth of the use of electricity could be gauged by the fact that whereas in 1927 2,600,000 householders were consumers, this figure had risen in the course of a little over ten years to 8,600,000. Even so, he believed that the true realisation of the value of electricity in domestic households was only just beginning. The news that the Great Western Railway Co. was considering the electrification of a portion of its short lines was very welcome and should have a gratifying reception in the South-West Area. Referring to the Electricity Distribution Bill, Lord Pentland said that a great deal had been written concerning the advantages and disadvantages of municipal and/or company supply, but nothing very much had been heard about the effects on the consumers, and he hoped nothing would be done which would impede or hold up development altogether. Local studies always brought to light special problems and difficulties which could not be settled from London by rule of thumb. Alderman J. Chuter Ede, M.P. (President of E.D.A.), responding, said that uncertainty was bad, and he considered that the sooner they knew their fate the better it would be for the industry. The toast of "Our Guests and Visitors" was proposed by Mr. G. J. Hollyer, M.I.E.E. (deputy chairman, Area Executive Committee), and responded to by Mr. R. Waller (president, Bristol Incorporated Chamber of Commerce). Among those present was Mr. W. J. Bache (president, I.M.E.A.). The prizes in connection with the Area public speaking competition were presented by Mrs. H. F. G. Woods to the following: Ladies' 1st prize: Miss F. Griffin (Bristol Corporation); 2nd prize: Miss G. Mason (Bristol Corporation). Men's 1st prize: Mr. R. Coffey (Bristol Corporation); 2nd prize: Mr. Compton (North Somerset Electric Supply Co., Ltd.).

E.A.W. Activities

This year the annual conference of the Electrical Association for Women will be held in London. Following registration at the headquarters, 20, Regent Street, S.W.1, on April 27th there will be a reception by the National Executive Committee at the Royal Institution in the evening, during which Prof. W. L. Bragg will speak on "Knowing all about Electricity." The next morning the annual general meeting will be held at Park Lane Hotel, followed by a luncheon. The Council meeting will be held in the afternoon and in the evening there will be a reception by the Committee of the London Branch at Over-Seas House, St. James's, S.W. On Friday morning there will be a branch session at the E.A.W. Club Room, Regent Street, when there will be a discussion



At the opening of the new Central London showrooms (see p. 279): Mr. J. M. Kennedy, Lord Lytton, Sir Cyril Hurcomb and Mr. C. G. Morley New *[Elec. Rev. photo.*

and talks on development work in the E.A.W. branches. Following a break for an informal lunch at the Popular Café, Piccadilly, the business of the branch session will be resumed in the afternoon. The annual ball will be held in the evening at the Park Lane Hotel, Piccadilly, and for those who do not wish to attend the ball an informal theatre party will be arranged, if desired.

The Upper Atmosphere and Radio

The upper atmosphere and its effects on radio were the subject of a paper by Mr. J. F. M. Mellor read before the London Students' Section of the Institution of Electrical Engineers on February 21st. The paper explains how a number of separate layers of ionised gases at heights of from 4 to 120 miles above the earth reflect in differing ways radio waves of various lengths. Explanations are offered for numerous associated phenomena, the author pointing out that the heights at which waves are reflected, and therefore their path lengths, depend on frequency. Thus in the ionised D layer, 50 miles up, the collision frequency of free electrons corresponds to the frequency of a 150-metre wave. The transmitted energy is absorbed in accentuating the movement of the free electrons in the layer. Consequently, when working on this wavelength only the ground wave can be utilised, the sky wave being useless.

Appointments Vacant

Chief electrical engineer for Perth Corporation.

Chief electrical and mechanical engineer for the Public Works Department, Palestine.

Meter engineer for the Sheerness and District Electric Supply Co., Ltd.

Senior draughtsman for Ilford Corporation.

Deputy electrical engineer for Tientsin Municipal Council.

(See our Classified Advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

NEATA fuses.

Readers should enclose stamped addressed envelopes when making their inquiries.

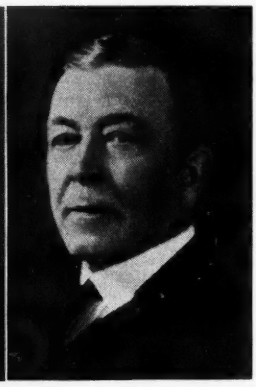
Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. F. Francis, burgh electrical engineer, Kirkcaldy, who is retiring, has had charge of the undertaking for thirty-six years and his association with electrical engineering extends over forty years. A native of Cheshire, he was with Bootle Corporation for many years, and then entered the service of Thomas Parker, Ltd., Wolverhampton. He supervised the Aldershot electricity undertaking before receiving his present post at Kirkcaldy. Mr. Francis will be succeeded by **Mr. G. F. Moore,** who has been deputy engineer for eighteen months. A Yorkshireman, he is vice-chairman of the Dundee Sub-Centre of the Institution of Electrical Engineers. He was assistant distribution engineer in Dundee for six years before taking a post with Carlisle Corporation.

Mr. D. C. Harben

Mr. F. A. Lawson



Sir Percy Douglas

Mr. H. Seston, formerly public relations officer of the Bermuda Electric Light and Traction Co., has joined Moffats, Ltd., of Blackburn.

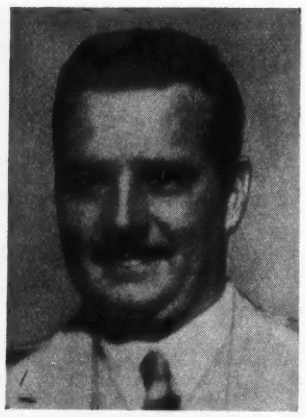
Sir Alexander Roger, chairman of British Insulated Cables, Ltd., and **Mr. A. Roger,** a director of the Telephone and General Trust, have returned to London from their recent visit to Warsaw and Eastern Galicia.

Mr. I. Day, A.M.I.E.E., who for the past twenty-four years has held the post of demonstrator in electrical engineering at the University of Hong Kong, resigned on December 31st. At a farewell gathering held in the University prior to his departure for England Mr. Day received gifts from the staff and students of the Engineering Faculty. He has now taken up permanent residence in this country.

Councillor G. Read, of Loughborough, chairman of the Gas and Electricity Committee, has been appointed a member of the East Midlands Electricity Advisory Board.

Mr. E. J. Evans, of Guest, Keen, Williams, Ltd., Calcutta, who during his three-months' stay in England has been attached to the service department of British Timken, Ltd., Aston, Birmingham, sailed for India on February 4th.

Mr. J. Orr, managing director of James Kilpatrick & Son, Ltd., of Glasgow and Paisley, has been appointed managing director of Duncan Watson (Electrical Engineers), Ltd., and **Mr. J. Shaw,** Mr. Orr's assistant with Kilpatrick, Ltd., has been appointed manager and a director of that company. Mr. Orr is managing director of both companies. The contracting business of Duncan Watson (Electrical Engineers), Ltd., was founded in 1896 by Sir Duncan Watson, its present chairman and governing director, and the company recently acquired the whole interests of James Kilpatrick & Son, Ltd. Sir Duncan was the first chairman of the London and Home Counties J.E.A., and in 1927 was elected a member of the Central Electricity Board. He is a director of the Perak River Hydro-Electric Power Co., Trussed Concrete Steel Co., Cumberland Property Trust and other public companies.



Mr. J. Orr

Mr. K. D. Weguelin, of the Birkenhead Corporation Electricity Department, has been appointed sales and consumers' engineer to the Newport Corporation Electricity Department as from March 21st next. Mr. Weguelin was formerly assistant consumers' engineer in the Wolverhampton Corporation Electricity Department.

Three new directors have recently joined the board of Elliott Bros. (London), Ltd. **Vice-Admiral Sir Percy Douglas,** K.C.B., C.M.G., entered the Navy in 1890, retiring in 1931. He is the inventor of various marine surveying instruments, such as the Douglas protractor and the Douglas-Appleyard arcless sextant. He is an associate of the Institution of Civil Engineers. **Mr. F. A. Lawson** is on the staff of Siemens Bros. & Co., Ltd. He received his technical training at the Liverpool University, and joined the Siemens Dynamo Works as a dynamo designer in 1909. In 1911 he was transferred to the company's London office. He is an A.M.I.E.E., and is on the board of Siemens Electric Lamps and Supplies, Ltd.; Siemens and General Electric Railway Signal Co., Ltd.; Alfred Graham & Co., Ltd.; the Fixed Price Light Co., Ltd.; and Telephone Installations (London), Ltd. **Mr. D. C. Harben** received his education at the Roan School, Greenwich, and in 1900 joined Alfred Yarrow & Co. Two years later he went to J. Stone & Co., Deptford, and in 1904 joined Elliott Bros., in their drawing office. From the drawing office he was transferred to the shops and test-room, and thence to the gyro compass department, and later he was employed in connection with the erection and servicing of this apparatus and also the fire-control apparatus of the Fleet. He returned to the works in 1917 to take charge of the Admiralty work then in course of manufacture, and was appointed assistant works manager by the company eleven years later, subsequently becoming works manager.

Mr. H. G. Batson

Mr. H. G. Batson has relinquished his position as illuminating engineer with Philips Lamps, Ltd., and has joined the illuminating staff of Rowlands Electrical Accessories, Ltd., as technical representative and adviser. Mr. Batson was educated at Ilkley Grammar School and Leeds University, and served for eight years as outside engineer on the staff of the Yorkshire Electric Power Co., and also with the Worcester Corporation Electricity Department, before specialising in lighting problems. He is an associate of the I.E.E. and of the Illuminating Engineering Society.

Mr. Alex. Watson, who has taken up an appointment with the Aberystwyth Corporation, asks us to state that he is not "mains assistant," as reported in our issue of January 21st, but mains and change-over engineer.

Mr. W. A. Jackson has been appointed chief electrical engineer to the Llandudno Urban District Council in succession to the late Mr. H. Morton. Mr. Jackson, who has been deputy engineer to the Council for a number of years, was for six years with the Wolverhampton Corporation as a charge engineer before going to Llandudno. Previous to that he held a similar position with the Motherwell Corporation. He was also with the Wigan Corporation at the time when the first electricity supply plant was being installed at the Bradford Place power station.

Mr. W. A. Jackson

Mr. F. G. Bell is retiring from the position of sales manager to the Phoenix Telephone & Electric Works, Ltd., which he has held for over seven years, owing to failing health. Mr. Bell was for fifteen years with the General Electric Co., Ltd., and except for a short break was with the Sterling Telephone & Electric Co., Ltd., for twenty-six years. He is being succeeded as sales manager of the Phoenix Co. by **Mr. H. F. Downing,** who has served under him for the last fifteen years.

Mr. R. R. Stokes, chairman and managing director of Ransomes & Rapier, Ltd., who was recently returned as Parliamentary representative for Ipswich, took his seat in the House on Monday last.

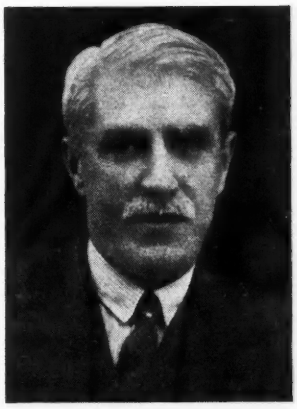
Obituary

Mr. A. H. Mackley.—We regret to record the death of Mr. Alfred Henry Mackley, a director of the Igranic Electric Co., Ltd., and for many years chief engineer at the company's Bedford works, which occurred on February 5th at the age of sixty. Mr. Mackley, who had completed more than thirty-five years with the Igranic Co., its predecessor, the Adams Manufacturing Co., and the parent company, the Sturtevant Engineering Co., Ltd., was born in London and was educated at the Goldsmiths' Institute, serving his apprenticeship with J. H. Pickup, electrical engineers, of Bury, Lancs. He was subsequently transferred to their London office, and in 1902 joined the Sturtevant Engineering Co. at its Bankside works.

The late Mr. A. H. Mackley

The Sturtevant Co. was at that time selling motor-starting and control gear, and when this portion of the business was transferred to the Adams Manufacturing Co. Mr. Mackley became chief engineer at the Bedford works, built in 1905. He contributed much to the progress made from the earlier types of hand-operated motor starters right up to the highly specialised self-acting control gear of the present day. He took particular interest in the world-wide business of the Igranic Co. in newspaper press-room equipment, and was a frequent visitor to the Continent in connection with installations of Igranic newspaper conveyors. He was the originator of a number of patents. He took a considerable interest in all the activities of the Igranic Social and Sports Club, and had been chairman of that organisation since its inception. He leaves a widow, two sons and a daughter. The funeral ceremony, at St. Cuthbert's Church, Bedford, on February 18th, was attended by a large number of his associates and employés of the Igranic Electric Co., as well as Masonic, personal and business friends from many parts of the country. Among those present were his fellow-directors, Mr. G. A. Mower (chairman) and Mr. G. R. Thursfield, and Mr. R. K. Fleming (general manager at the Bedford works), Mr. J. R. Taylor (chief engineer) and representatives from the several branch offices of the company.

Mr. E. Wilson.—We regret to record the death of Mr. Ernest Wilson, general manager of Fraser & Chalmers Engineering Works, which occurred after a short and sudden illness, on February 18th, at the age of sixty-three. Mr. Wilson began his career with the General Electric Co., Ltd., in 1892, and after nine years in various departments of the company in London he went, at the starting of the engineering works at Witton in 1907, to take charge there of the commercial affairs. He occupied this position until 1918, when the G.E.C. absorbed Fraser and Chalmers, and he went to Erith as general manager. He was president of the London and District Association of Engineering Employers. Mr. Wilson's services were also in constant demand for a variety of public and social works. He was actively connected with the Erith Hospital, the Education Committee, the Rotarian Movement, the Economic League and sports associations. He leaves a widow and three children



The late Mr. E. Wilson

Mr. E. N. Jones, electrical contractor, of Wrexham, whose death has occurred after a brief illness at the age of fifty-six years, was a prominent business man of the town. He was a native of the Oswestry district, and carried on business as an electrician and electrical engineer at Bridge Street. He had carried out numerous important contracts on public works and housing estates. He was the secretary of the local branch of the Electrical Contractors' Association.

Mr. H. Holcroft.—We regret to learn of the death of Mr. H. Holcroft, who for over twenty years was chief electrical engineer to Earle, Bourne & Co., Ltd.

Mr. A. Hillyer.—The death is announced, at the age of eighty-one, of Mr. Arthur Hillyer, who established the Wickford Electric Light Co., of which he became managing director.

Wills.—Mr. F. H. Thornton, chairman of the Northampton Electric Light and Power Co., the Rushden and District Electric Supply Co., and the Wellingborough Electric Supply Co., left £92,178, with net personalty £56,002.

Mr. T. H. Gardner, chairman of L. Gardner & Sons, left £159,474 with net personalty £147,530.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Parolle Electrical Plant Co., Ltd.—Private company. Registered February 14th. Nominal capital, £100,000. Objects: To carry on the business of manufacturers and suppliers of and dealers in machinery, plant, cables, apparatus and all other materials used in connection with the provision and execution of civil engineering, mechanical, electrical and/or other plant and works, &c., and to adopt an agreement with a company of similar name (incorporated on January 17th, 1934) and J. M. S. Coates (the liquidator). The directors are: F. G. H. Bedford. "Fairlawn," Wylam-on-Tyne, director; H. W. Clothier, address not stated; N. Merz, C.A., Allerwash, Fourstones, Northumberland; and P. E. Newman and G. Wansbrough, addresses not stated. Solicitors: Watson, Burton, Booth & Robinson, Pilgrim House, Newcastle-on-Tyne.

Sordoviso, Ltd.—Private company. Registered February 15th. Capital, £27,000. Objects: To acquire the business of an electrical switchgear manufacturer carried on by A. L. G. Cianchi at Golders Green, N.W., and all patents, machinery and other assets, including trade mark No: 550183 and all other trade marks owned by him in connection therewith. The first directors are: J. C. Padgeon, E. M. Halsted, A. L. G. Cianchi and Brian G. Donne. Solicitors: Reynolds, Sons & Gorst, 7, Arundel Street, W.C.2.

Northern General Supplies Co., Ltd.—Private company. Registered February 19th. Capital, £1.000. Objects: To carry on the business of agents for and factors and dealers in engines, motors, dynamos, pumps, castings, tubing, boilers, machinery and implements, tools, &c. The directors are: C. Pullan, 18, Harlow Moor Drive, Harrogate, and W. K. Bird, Red Lodge, West Park Drive, Leeds. Secretary, W. K. Bird. Registered office: Prudential Buildings, Park Row, Leeds.

Simon Electric Floor Scrubbers, Ltd.—Private company. Registered February 17th. Capital, £4,500. Objects: To adopt an agreement with L. J. Simon for the purchase of a licence to manufacture, sell, let on hire and otherwise deal in electric cleaners known as the Simon electric scrubbers, and to carry on the business of electrical engineers and contractors, &c. The directors are: C. F. Parsons, Highfield, Totteridge Green, N.21; E. C. Carling, 96, Fairholt Road, N.16: L. J. Simon, M.I.Mech.E., &c., 25, Ashburton Avenue, South Park Drive, Ilford; and E. A. L. Robey, Avalon, Eversley Crescent, N.21. Registered office: 166, Albion Road, N.16.

Wallacetown Engineering Co., Ltd.—Private company. Registered in Edinburgh February 14th. Capital, £10,000. Objects: To acquire the business of a mining, mechanical and electrical engineer now carried on by William M. Ritchie as the Wallacetown Engineering Co. at Viewfield Road, Ayr. The directors are: W. M. Ritchie, Croftpark, Prestwick Road, Ayr; Mrs. C. H. M. Ritchie, Croftpark, Prestwick Road, Ayr; and J. Ritchie, 16, Graigie Road, Ayr. Registered office: 62, Viewfield Road, Ayr.

Alex Moore, Ltd.—Private company. Registered in Edinburgh February 18th. Capital, £1,000. Objects: To carry on the business of manufacturers, merchants, electrical and mechanical engineers, builders, contractors, &c. The directors are: A. Moore, 88A. Castle Street, Glasgow, C.4, and L. Moore, 72, Langrid Road, Balornock, Glasgow. Registered office: 88A. Castle Street, Glasgow.

Barstow Trust, Ltd.—Private company. Registered February 19th. Capital, £1.000. Objects: To carry on the business of hire-purchase financiers, and in particular, to finance the sale by way of hire-purchase or deferred payments or otherwise of radio, television and electrical appliances, &c. The permanent directors are: H. Hardy, 41, Balne Lane, Wakefield, and M. N. Kitson, 23, Carr Lane, Wakefield.

R. J. S. Services, Ltd.—Private company. Registered February 14th. Capital, £1,000. Objects: To acquire the business of a manufacturer and merchant of gramophones and cycles and radio and electrical apparatus now carried on by R. A. Johnson and formerly by C. Gilbert and Co., Ltd., at Pall Mall and Marsh Street, Hanley, Stoke-on-Trent. The directors are: R. A. Johnson (permanent managing director), Kings Arms Hotel, Meir, Stoke-on-Trent, and J. Swift, Wilma, Chell Green Avenue, Chell, Stoke-on-Trent. Secretary: J. Swift. Registered office: 24, Marsh Street, Hanley, Stoke-on-Trent.

Returns of Electrical Companies

Bowlings Electric Supply, Ltd.—Further charge on the company's undertaking and property, present and future, including uncalled capital, dated February 10th, 1938, to secure £800 (inclusive of £300 secured by debenture dated November 12th, 1937). Holders: E. H. Lane, 10, Carlos Place, W.1, and T. M. Bennett, 43, Bloomsbury Square, W.C.1.

Scott Insulated Wire Co., Ltd.—Capital, £14,000 in 4,000 preference and 10,000 ordinary shares of £1. Return dated December 30th, 1937. 2,075 preference and 10,000 ordinary shares taken up. £12,075 paid. Mortgages and charges, £5,690.

Neon Installations, Ltd. (in liquidation).—B. Davis, of 169, Regent Street, W., was appointed receiver and manager on February 10th, 1938, under powers contained in debenture dated June 8th, 1934.

Nefa Co., Ltd.—M. Rubens, of Bristol House, Southampton Row, W.C.1, was appointed receiver and/or manager on January 31st, 1938, under powers contained in debenture dated February 16th, 1924.

Lacy-Hulbert & Co., Ltd.—Satisfaction in full on February 7th, 1938, of deposit of deeds dated May 15th, 1937, and registered May 22nd, 1937. (According to the register of mortgages the deposit registered May 22nd, 1937, originally secured all moneys due to bank.)

Durham County Relay Service, Ltd.—Capital, £4,000 in 4,800 shares of 5s. and 2,800 shares of £1. Return dated August 9th, 1937 (filed February 1st, 1938). 4,800 5s. and 2,325 £1 shares taken up. £3,525 paid. Mortgages and charges, £400.

Corwen Electric Light Co., Ltd.—Capital, £2,000 in £1 shares. Return dated November 3rd, 1937. 1,610 shares taken up. £1,610 paid. Mortgages and charges, nil.

Brilliant Neon, Ltd.—Capital, £100 in £1 shares. Return dated October 8th (filed November 2nd), 1937. Two shares taken up. £2 paid. Mortgages and charges, nil.

Modern Refrigerator Sales, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated February 1st, 1938, to secure £500. Holder: S. J. Bowyer, 57/60, Holborn Viaduct, E.C.

John Dugdill & Co., Ltd.—Capital, £10,000 in £1 shares. Return dated October 11th, 1937. All shares taken up. £3 paid, £9,997 considered as paid. Mortgages and charges nil.

Modern Electrical Appliances Co., Ltd.—Capital, £500 in 5,000 shares of 2s. Return dated January 5th, 1938. 460 shares taken up. £46 paid. Mortgages and charges nil.

Electrical Manufacturing and Plating Co., Ltd.—Capital, £300 in £1 shares. Return dated December 31st, 1937. All shares taken up. £300 considered as paid. Mortgages and charges nil.

W. G. Cannon & Sons, Ltd.—Capital, £3,000 in £1 shares. Return dated September 15th, 1937. All shares taken up. £9 paid, £2,991 considered as paid. Mortgages and charges nil.

Eco Power, Ltd.—Capital, £1,000 in £1 shares. Return dated September 7th, 1937. All shares taken up. £1,000 paid. Mortgages and charges nil.

Crosland, Ltd.—Capital, £2,000 in £1 shares. Return dated October 12th, 1937. 1,002 shares taken up. £1,002 paid. Mortgages and charges nil.

G. P. Cosway, Ltd.—Satisfaction in full on February 3rd, 1938, of debentures authorised September 30th, 1937, and registered October 6th, 1937, securing £800.

Wireless Instruments (Leeds), Ltd.—Capital, £500 in £1 shares. Return dated December 2nd, 1937. All shares taken up. £500 paid. Mortgages and charges: £3,000.

City Notes

The Yorkshire Electric Power Co.—Presiding at the annual meeting on February 21st Mr. R. Armitage said that the capacity of their Ferrybridge station was being increased from 40,000 to 130,000 kW. Their transmission system was also being extended to meet the growing demands for electricity in all parts of their area. All these developments required capital, and they had made provision for a part of it by the issue, in January last, of the balance of the authorised 3½ per cent. debenture stock to the amount of £481,000. This issue exhausted their present borrowing powers, and a resolution would be submitted empowering the directors to issue the balance of the authorised share capital, amounting to £1,877,000. It was not proposed to make an immediate issue either of ordinary or preference shares, but shares would be offered in due course as and when and on such terms as the directors considered to be in the best interests of the company. The quantity of electricity sold to consumers was over 13 per cent. more than in 1936, and the export to the Central Electricity Board was also greater. They not only made a reduction in the basic price of electricity last year, but gave a further benefit to their consumers in a reduction of the scale charges under the coal clause, so that the substantial increase in the price of coal which was taking place would have a smaller effect on the price of electricity than it would have done a few years ago. The increased investment in the North Lincolnshire and Howdenshire Co. had been spent in further developing the area, where they were supplying ninety villages and towns as well as an increasing number of industrial undertakings. Electricity House, Ltd., began active operations on January 1st and the Power Company had agreed with the Distribution Company to take equal shares in providing the capital of the new company, which amounted to £50,000. The amount of new business secured last year and the steady growth of their general supply were indications of their increasing efficiency, and that they were not only willing but also fully equipped to take an increasing part in the forward movement resulting from the Government proposals for unification of distribution.

The English Electric Co., Ltd., held its annual meeting on February 22nd, when Mr. G. H. Nelson (chairman), who presided, said that the improvement in their trading results was due not only to better trading conditions in those products which had constituted their main business in the past, but in part to the arrangements made in bad times for the expansion of their business and the range of their manufactures. They had brought into the current year the largest order book in their history in terms both of value and of volume, and the unexecuted orders at January 1st, 1938, were approximately equal to their invoicings for 1937. There had been references in the Press to the supposed decline in activity in the electrical industry, but although they could not expect the company to continue to increase its turnover every year at the same rate as in recent years, they had at present no indication of trade falling away. With regard to the increases in the cost of materials and wages, they had not increased their basic price level more than was necessary properly to stabilise their business to cover increased cost of labour and material. Their export business had increased substantially over the previous year, but trading overseas was difficult, competition being severe, particularly from Germany and Switzerland. The remedy for uneconomic competition must lie partly in Government action, as opportunity offered through the negotiation of trade agreements, but primarily in arrangements between manufacturers in the leading industrial countries. In their export order book for the year were substantial repeat orders from the Victoria Falls and Transvaal Power Co., for large transformers; orders for further railway equipments for the South African Railways for the Capetown suburban lines; from India and Australia for new steel works equipment; from the Argentine for rolling stock; and from the Crown Agents for the Colonies, from Trinidad and many other parts of the world for Diesel engines. They were actively pursuing the policy advocated by the Government of developing overseas trade, and in spite of the magnitude of the present home demand they had reserved a considerable percentage of their productive capacity to meet overseas requirements. In connection with research, the switch testing station was now well advanced and they had added to it an extension for the surge testing of transformers. The whole installation should be in operation soon after the middle of the year. In addition to the orders already mentioned some of the important contracts received included substantial orders from electricity supply undertakings for large steam turbine generating sets, and for these undertakings and the Central Electricity Board orders for transformers of all sizes up to 50,000 kVA and for switchgear of all capacities. They had supplied complete machinery for the new Trinity House vessel *Patricia*, and they had received a further order from the Thames Tug and Lighterage Co. for equipment for the *Robertsbridge*. Orders had been received from the Southern Railway for three Diesel-electric shunting locomotives which were now in operation, and they had also received orders from British-owned railways in the Argentine, from the Federated Malay States and from the Ceylon Government Railways, for their new design of lightweight rail stock. They continued to obtain their share of the water turbine business, orders received including five 10,000-b.h.p. d.c. sets for the British Aluminium Co. Orders had also been received for other sets for Australia, India and South Africa. The official opening of the last sections of the electrified line round Warsaw took place in December last. They continued to receive orders from the Southern Railway both for the suburban and express stock, and in addition had received from that company orders for two main line electric locomotives, which should be completed this year. During the year they delivered three main-line locomotives to the New Zealand Government and had also delivered completely equipped motor coaches made entirely in their own works.

[*Elliott & Fry*

Mr. G. H. Nelson

The Lancashire Electric Light & Power Co., Ltd., reports a trading profit of subsidiary companies for 1937, plus interest receivable, of £506,278, as compared with £426,056 in the preceding year, to which is added £8,078 brought in, making £514,356. Of this £31,803 is appropriated for income tax, £182,000 for depreciation, and £5,290 is carried forward, leaving a balance of £295,258, which with management fees and sundry receipts amounts to £308,584. After providing for directors' fees, establishment charges and debenture interest and adding £5,642 brought forward, the available balance is £253,584. The final dividend on the ordinary stock is 5 per cent., making 7½ per cent. for the year, and £7,169 is carried forward. In 1936 a total distribution of 7½ per cent. was made on the ordinary stock, but was paid on smaller capital. The second 51,600-kW turbo-alternator at Kearsley is approaching completion and is expected to run on commercial load during the summer. During the year 600,000 ordinary shares of £1 each were offered to ordinary and preference stockholders at 27s. 6d. per share, and the net premium, less expenses of

issue, has been added to the reserve and depreciation account. The shares when fully paid were converted into stock. The results of the Lancashire Electric Power Co. for 1937 were as follows:—Profit on trading, £501,797 (against £423,065); sales, excluding C.E.B., 449,009,916 kWh (369,739,212 kWh); exported to C.E.B., 341,642,300 kWh (183,886,000 kWh); maximum load, excluding C.E.B., 140,076 kW (128,067 kW); kW connected, 176,213 (162,762). Meeting: March 3rd.

Philco Radio & Television Corporation of Great Britain, Ltd., reports a loss for 1937 of £111,504, as compared with a profit of £102,415 in 1936. The balance brought in is £27,980, and other credits are £9,314 for expenses not required and £19,484 reserved for taxation, making £56,778. After deducting the June, 1937, half-year's preference dividend and £2,436 loss of a subsidiary, there is a debit of £65,037, which is carried to the balance sheet. The *Financial Times* reports that in an advance copy of the chairman's speech it is stated that the complete collapse of the autumn season was wholly unexpected. During November the company took back from distributors a large number of sets and granted rebates amounting to over £50.000 to enable distributors and dealers to compete with reduced market prices. The company's loss for November was nearly £56,000. In December the board decided to clear the bulk of its stocks. This caused a loss of approximately £45,900 in December which otherwise would have fallen into 1938. A complete reorganisation cut the operating costs of the company by half. The Philadelphia Storage Battery Co., the parent company, voluntarily authorised the company to hold in abeyance payment on its shares of the ordinary dividend for 1936. Meeting: March 7th.

Electricity Supply Companies' Dividends.—*Slough and Datchet Electric Supply Co.*—Profit for 1937, £47,682, plus £1,214 brought in. Ordinary dividend 8 per cent., tax free (against 5½ per cent. on smaller capital). Carry forward £1,221.

Uxbridge and District Electric Supply Co,—Profit for 1937, £150,095. Ordinary dividend 8 per cent., tax free (same), but on larger capital. Balance carried forward £1,568 (£2,226 brought in).

Windsor Electrical Installation Co.—Profit for 1937, £19,681. Dividend on the ordinary shares, 8 per cent. (against 5 per cent.). Balance carried forward, £1,055 (£879 brought in).

Egham and Staines Electricity Co.—Trading profit for 1937, £86,114. Ordinary dividend of 7 per cent., tax free (against 4 per cent., tax free). Forward, £1,283.

Chesham Electric Light and Power Co.—Trading profit of £29,572 for 1937. Ordinary dividend unchanged at 8 per cent., tax free. Balance carried forward, £895 (£334 brought in).

Chipping Norton Electric Supply Co.—Trading profit of £1,996 for 1937. After providing for loan interest, depreciation and reserve, a balance of £99 is carried forward.

The Notting Hill Electric Lighting Co. reports a net working profit of £66,354, as compared with £62,567 in the preceding year. To this is added £9,407 brought in and dividend on investment (£62), making £75,823. After providing for debenture interest, &c., it is proposed to pay an ordinary dividend of 8.0646 per cent. (same), and to carry forward £12,614. During the year a further £1,950 5 per cent. debenture stock was redeemed, the balance now outstanding being £138,000.

Charles Clifford & Son, Ltd., report a net profit for 1937 of £21,597, as compared with £17,299 for the preceding year. To this is added £21,592 brought in, making £43,189. The final ordinary dividend is 5 per cent., making 10 per cent. for the year, plus a bonus of 7½ per cent., both tax free. General reserve receives £8,000 and plant renovation reserve £835, leaving £22,054 to be carried forward.

Richardsons, Westgarth & Co., Ltd.—At the annual meeting on February 21st approval was given to the scheme of amalgamation and arrangement of Richardsons Westgarth, North Eastern Marine Engineering Co., and George Clarke (1936), Ltd. Mr. R. S. Middleton (chairman) said that the company had a well-filled order book and provided present conditions continued the amalgamated business should greatly improve on present results.

The Rawlplug Co., Ltd.—In the course of his speech at the annual meeting on February 21st Mr. J. J. Rawlings (chairman) said that factories for the manufacture of their products had been set up at Delft (Holland) and Zurich (Switzerland). These were in addition to the works in London, Berlin, Paris, New York and Kobe. Branches with agencies had been established in over eighty different countries.

The Mid-Southern Utility Co., Ltd., reports a profit on its electricity, water and gas undertakings of £115,349, as compared with £107,542 in the preceding year, to which is added £24,696 brought in. It is proposed to pay the full statutory dividends on the "A," "B," and "C" stocks, and to carry forward £19,790. The profit on the electricity undertaking was £80,330.

The North Wales Power Co., Ltd., has declared an ordinary dividend of 5½ per cent. for 1937. In the previous two years a dividend of 7 per cent. was distributed, but the present dividend is payable on doubled capital, the 2,000,000 10s. ordinary shares issued in April last now ranking for dividend.

The Adelaide Electric Supply Co., Ltd., which has offered holders of the 5½ per cent. redeemable consolidated debenture stock (English stock) an opportunity of converting into new 4½ per cent. consolidated debenture stock, has now decided that the principal of the stock shall be free of all Australian taxes (if any) which the company may be required to pay in respect of principal payable to stockholders resident outside Australia.

The Clyde Valley Electrical Power Co. is paying a final ordinary dividend of 5 per cent. (same), maintaining the distribution for the year at 8 per cent.

Max Stone, Ltd., is not paying an interim dividend on its ordinary capital. Last year an interim of 5 per cent. was followed by a final dividend of 12½ per cent., making 17½ per cent. for the year.

The British Power & Light Corporation, Ltd., is paying a final ordinary dividend of 5 per cent., making 7 per cent., less tax, for 1937. This compares with 6 per cent. for 1936.

The Farnham Gas & Electricity Co. reports a net profit for 1937 of £21,621. The dividend is maintained at 7 per cent., and £8,009 is carried forward.

Hall Telephone Accessories (1928), Ltd., has announced a final dividend of 5 per cent., and a bonus of 5 per cent., making 15 per cent., less tax, for the year (against 16 per cent.).

The City of London Electric Lighting Co., Ltd., is paying a final dividend of 4 per cent., maintaining the distribution for the year at 7½ per cent.

The Folkestone Electricity Supply Co., Ltd., has announced a final dividend of 6 per cent., making 10 per cent. for the year, tax free (same).

Cable and Wireless (Holding), Ltd., announces payment of a dividend on the preference stock of 2¾ per cent., less tax, for the half-year ended December 31st.

The Midland Counties Electric Supply Co., Ltd., has declared a final dividend of 5½ per cent., less tax, making 8 per cent. for the year (same).

Clarke, Chapman & Co., Ltd., are paying a dividend of 10 per cent. for the year (against 8 per cent.).

The Consolidated Gas, Electric Light and Power Co. of Baltimore has declared a quarterly dividend of 90 cents on the common shares.

The Cables Investment Trust is paying an interim dividend of 2 per cent. (same).

Stocks and Shares

TUESDAY EVENING.

POLITICS play the predominant part in determining Stock Exchange values at the moment. The domestic crisis, so called, which arose over the week-end in connection with the resignation of Mr. Eden from the Cabinet, was held at first to be a possible precursor to a General Election. This would be the reverse of welcome at the present time, and the immediate effect was to bring about a weakening of prices in the gilt-edged market. Further consideration showed there to be no likelihood of an appeal to the country, and prompt recovery followed.

The speech of Herr Hitler on European affairs exercised no particular effect. The latest developments of President Roosevelt's curious policy led to a fairly general rise in American securities, and this, in its turn, helped to promote a more confident turn in markets on our side. President Roosevelt advocates the raising of prices of those commodities which are not subject to monopolistic control, and, on the strength of this, improvement occurred in rubber, the better tone being assisted by the prospect of a five years' extension of the control plan.

Business in the Stock Exchange is quiet, markets having become inured to various shocks. The speech of the Prime Minister, read by Lord Derby at the B.I.F. dinner on Monday night, showed the Government view of the business outlook to be quietly confident. The figures quoted by Mr. Chamberlain demonstrated that whatever recession may lately have taken place in trade, the nation's principal industries continue to make progress.

Electricity Supply Market

Prices for electricity supply shares were undisturbed by the wave of depression amongst other industrial markets. This emphasises the composure with which the market views the future of the industry—Bill or no Bill. Dividends so far announced have usually followed expectations, except in the case of British Power and Light, which company pleasantly surprised the market with a distribution making 7 per cent., against last year's 6 per cent. The shares suitably recognised the announcement with a rise in price from 27s. 9d. to 29s. Preference shares in the group have remained somewhat under a cloud since the Oxford Electric negotiations have brought into prominence the question of preference shareholders' rights in the event of a liquidation. Some chariness is being shown as a result to shares standing at high premiums over their nominal values. Effects of this tendency have not, however, been far-reaching. On such relatively high-priced preference shares as Scottish Power 6 per cents., at 28s. 3d., Midland Counties 6 per cents., at 29s., and North-Eastern 7 per cents., at 33s., the yield is no more than 4¼ per cent., or within a few pence of that rate. On the other hand, the return on a low-priced share like Mid-Cheshire Electric 4 per cent. preference, at 20s. 3d., is a shilling under 4 per cent.

Electrical Equipment Shares

Potential buyers of industrial ordinary shares retired further into their shells as a first reaction to the latest political developments. Prices fell to a general level below the depressed points reached in November last. The first shock over, however, buyers took sufficient heart to bring about an all-round recovery from the worst. By way of a change, the American news gave a helping hand. Notwithstanding this improvement, industrial markets again show, on balance, a batch of price-falls. Electrical equipment shares were hit as hardly as any by the steady, albeit seldom heavy selling pressure, but they rallied readily as soon as conditions took a turn for the better. General Electric, at 71s. 6d., have made good the whole of a drop to well under 70s. Associated Electricals, at 40s. 6d., are 6d. up after having been about 2s. down at one time. Cable manufacturing shares have had a poor week: British Insulated, at 44, Callenders, at 4 3/16, Enfields, at 4 1/8, and Johnson and Phillips, at 38s. 9d., show

losses ranging up to 5s. A disappointing response to the raising of the Telegraph Construction dividend from 7½ to 10 per cent. has left the shares approximately 8s. 9d. lower, at 38s. 9d. ex dividend, since the announcement. Lancashire Dynamos, at 3¼, are another dull spot.

Crompton Parkinsons

The price of Crompton Parkinson ordinary shares fell, at one time last week, to 22s. 6d.—the lowest point for many a day. A recovery to 25s. was apparently due to realisation that the letters of acceptance or renunciation of the bonus shares issued towards the end of last year must by now be lodged with the company for registration. This means an end to the sales of stamp-free allotment letters which have been trickling in ever since the issue from allottees who preferred cash to new shares.

Industrial Yields

Present returns on first-class industrial shares are now generous enough to imply that prices make a wide allowance for such doubts as exist in regard to the course of trade. To support this view, it may be pointed out that industrial dividend announcements are still reflecting trade prosperity, and that yields can be expected in several instances to be stepped up by this year's earnings. Moreover, yields on good industrials are anything up to double the return offered by gilt-edged stocks at the present exalted levels. This last consideration has led some people to expect a "spilling-over," into industrial markets, of the money which at present finds its chief outlet in purely safety-first directions. The electrical equipment market can show several first-class ordinary shares which can now be bought to pay a shilling or so either side of 5 per cent. on the money. Among them are General Electrics, Siemens, Associated Electricals, and Enfield Cables. Returns of between 5½ per cent. and 6 per cent. are to be obtained from Electric Constructions, Switchgear and Cowans, and others. For returns above the 6 per cent. mark there are English Electrics, Crabtree Electricals, Westinghouse Brakes, Strand Electrics and Ever Ready.

Cable and Wireless

People are making optimistic forecasts of the agreement which is thought to be near conclusion between Cable and Wireless and the Empire Governments. A sizeable reduction in the combine's beam rental and in maintenance costs is hoped for. As a result, Cable and Wireless ordinary stock is among the few issues which show improvement in price on the week, despite some disappointment with the latest traffics index number. At 67, the quotation is 4 points better than it was a fortnight ago. There is no change in the preference or income issues. Neither has there been any change in the shares of Globe Telegraph company, a big holder of Cable and Wireless stocks. Marconi-Marines have eased off to 28s. 9d. American Telephone and Telegraph, at 137½, recovered 3 points of the recent heavy drop, but other dollar communication stocks are not much altered, Western Unions being 25 and Internationals 6¾.

Airmail

Starting on the Monday in this week, the charge for airmail letters to India, Burma, and other places in the East, has been reduced to 1½d. per half ounce, as against the 6d. rate that previously obtained. This follows upon the reduction of the 6d. rate to any place in Africa. In addition to the lowering of the charge, a fresh number of air posts come into operation. This, it is thought, will make its influence felt upon Cable and Wireless, whose traffics may be affected not so much, perhaps, by the airmail reduction in postage charges, as by the facilities which the airmail offers in competition, as it were, with week-end cables and other cheap forms of communication offered by the cable companies.

There are some private users of the airmail who frankly admit that the reduction to 1½d., coupled with the additional air-posts, appears to be hardly necessary. They are glad to have the reduction in postage but, at the same time, are inclined to argue that the competition which this sets up with cable companies may not be altogether just to the latter. Expansion of airmail facilities will no doubt continue, and it may not be long before a letter which costs 2½d. to send, say to Paris, can be sent by air-mail to Australia for 1½d.

Miscellaneous Matters

Latest developments in Germany acted first as a check to the upward course of gilt-edged prices, but later as a fresh stimulus to the appetite for stocks giving the highest security. London Transport "C" stock, at 82, ex-dividend, has retained the 2 points rise which followed an expression of opinion by the chairman of Tillings that the full standard dividend of 5½ per cent. might reasonably be expected this year. Tillings, at 57s., are quoted ex-dividend but cum-bonus. Evaporation of interest in Buenos Ayres transport stocks has continued since details of the co-ordination scheme were made known. Anglo-Argentine Tramway 5 per cent. debentures have come back to under 20, and the second preference are 1s. 3d. lower, at 2s. 6d. Brazilian Tractions, at 11½, have picked up ⅝. The Home Railway market was pleased with the raising of the dividend on L.N.E.R. second preference from 1¾ per cent. to 4 per cent. The Great Western's decision to electrify a part of its lines is taken as a good augury for electrical equipment manufacturers.

Share List of Electrical Companies

	Dividend. Nom. Previous.	Dividend. Nom. Last.	Price Feb. 22.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.					
Bournemouth and Poole	1	15	67/6	—	4 9 0
City of London	1	7½	34/–xd.	+6d.	4 8 3
Clyde Valley	1	7	41/–	—	3 18 1
County of London	1	10½	50/6	–6d.	4 3 4
Edmundson's 7% Pref.	1	7	32/6	—	4 6 2
Do. Ord.	1	8	38/–	—	4 14 9
Elec. Dis. Yorkshire	1	9	42/–xd.	–	4 5 10
Elec. Fin. and Securities	1	12½	51/3	—	4 17 6
Elec. Supply Corporation	1	11	52/6	—	4 11 5
Lancs Light and Power	1	7½	35/–	—	4 5 9
Lond. Assoc. Electric	1	—	32/–	—	4 7 6
London Electric	1	8	35/6	—	3 19 0
London Power Deb. Red.	Stock	5	106xd.	—	4 14 4
Metropolitan	1	10	46/–	—	4 7 0
Midland Counties	1	7½	37/6	—	4 5 0
Mid. Elec. Power	1	8	9 2/16	—	4 7 4
North Eastern Electric Ordinary	1	6	32/–	—	4 7 6
Do. 7% Pref.	1	7	33/–	—	4 4 10
Northampton	1	10	46/3xd.	—	4 6 7
Notting Hill 6% Pref.	10	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	48/9	—	4 2 0
Do. do. 6% Pref.	1	6	30/–	—	4 0 0
Scottish Power	1	8	37/6	—	4 5 3
South London	1	7	32/6	—	4 6 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	21/–	—	7 2 10
Yorkshire Elec.	1	8	40/–	—	4 0 9
PUBLIC BOARDS					
Central Electricity, 1950–70	Stock	5	113	—	4 8 6
Do. 1955–75	,,	5	117	—	4 5 6
Do. 1951–73	,,	4½	111	—	4 1 1
Do. 1963–93	,,	—	3½	100	— 3 10 0
London Elec. Trans. Gtd.	,,	—	2½	91	— 2 15 0
London & Home Counties, 1955–75	,,	4½	4½	112	— 4 0 4
London Passenger Transport, A	,,	—	4½	118½	— 3 16 3
Do. do. B	,,	—	5	121½	— 4 2 4
Do. do. C	,,	4	4½	82xd.	— 5 3 8
West Midlands Joint Elec. 1948–68	,,	—	5	115	— 4 7 0
TELEGRAPH AND TELEPHONE.					
American Tel. & Tel.	$160	9	9	137½	+3 6 11 0
Anglo-Am. Tel. Pref.	Stock	6	6	111½	–2 5 7 7
Do. Def.	,,	1½	1½	27	— 5 11 3
Cable & Wireless 5½% Pref.	,,	4½	5½	103	— 5 6 10
Do. Ord.	,,	—	—	67	+2 —
Do. Income	,,	—	—	101½	— 3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	14½	— 3 14 9
Do. do. Pref.	10	6	6	13¾	— 4 7 3
Great Northern Tel.	10	20	20	39½	— 5 1 3
Marconi-Marine	1	10	7½	28/9	–9d. 5 4 4
Oriental Telephone Ord.	1	12*	12*	2 1/16	— 4 9 3
HOME AND FOREIGN TRAMS, ETC.					
Anglo-Arg. Trams First Pref.	5	Nil	Nil	7/–	— —
Do. do. 2nd Pref.	5	Nil	Nil	2/6	–1/8 —
Do. do. 5% Deb.	Stock	Nil	Nil	18½	–2 —
British Electric Traction Def. Ord.	,,	5	5	937	–25 —
Do. do. Pref. Ord.	,,	8	8	160	–5 4 17 0
Brazil Traction	$100	70 cts.	$1	11½	+⅛ —
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	103½	— 4 14 9
Mexican Light Common	$100	Nil	Nil	1½	— —
Do. 1st Bonds	$500	5	5	35	— —
Victoria Falls Ord.	1	20	12	3	— 4 0 0
West Riding	1	6½	10	2	— 5 0 0
MANUFACTURING COMPANIES.					
Aron Electricity Ord.	1	15	15	1⅞	— 8 0 0
Assoc. Elec. Ord.	1	8	10	40/6	+6d. 4 18 9
Do. Pref.	1	8	8	38/–	— 4 4 6
Babcock & Wilcox	1	8	10	42/–	+1/– 4 15 3
British Aluminium Ord.	1	7½	10	43/9	+1/8 4 11 4
British Insulated Ord.	Stock	20	20	4½	–¼ 4 9 0
Brush Ord.	Stock	Nil	Nil	21½	— —
Callender's	1	15	15	4 1/16	–¼ 3 11 1
Do. 6½% Pref.	1	6½	6½	31/3	— 4 2 4
Crompton Parkinson Ord.	5/–	12½	12½	25/–	— —
Do. 8% Pref.	1	8	8	37/6	— 4 5 4
Electric Construction	1	7	10	1⅜	— 5 14 4
Enfield Cable Ord.	1	25	25	4 1/16	–⅛ 5 1 3
English Electric	1	Nil	10	30/–	— 6 13 4
Do. do. Pref.	1	6½	6½	25/6	— 5 2 0
Ericsson Tel.	5/–	20	25*	1⅞	–1/8 3 6 7
Ever Ready	5/–	35	45	26/–	— 8 13 2
Ferranti Pref.	1	7	7	27/6	— 5 1 10
G.E.C. Pref.	1	6½	6½	32/6	— 4 0 0
Do. Ord.	1	15	17½	71/6	— 4 18 4
Henley's	5/–	30	15	19/6	— 3 17 0
Do. 4½% Pref.	1	4½	4½	1½xd.	— 4 0 0
India-Rubber Pref.	1	5½	5½	22/–	— 5 0 0
Johnson & Phillips	1	½	10	38/9	–⅛ 5 3 1
Lancashire Dynamo	1	10	20	3½	–⅛ 6 3 1
Siemens Ord.	1	6	7½	28/9	— 5 4 4
Telegraph Construction	£1	7½	10	38/9xd.	–½ 5 3 1

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

14290. "Thermionic valve circuits." W. S. Percival. May 20th, 1936. (478734.)

14796. "Electron-discharge tubes." J. H. O. Harries. May 25th, 1936. (478812.)

17646. "Methods of producing flat surfaces, more particularly in the construction of electrodes for electric-discharge tubes." H. E. Holman. June 25th, 1936. (479024.)

17693. "Electron multiplier arrangements." Marconi's Wireless Telegraph Co., Ltd., and G. B. Banks. June 25th, 1936. (478813.)

20302. "Alternating-current measuring bridges." Siemens and Halske Akt.-Ges. October 3rd, 1935. (478880.)

20345. "Apparatus for regulating voltage or other electrical quantities in alternating-current systems." Allgemeine Elektricitäts-Ges. July 24th, 1935. (Addition to 460996.) (479027.)

20547. "Circuit arrangements for receiving television and the like." General Electric Co., Ltd., D. C. Espley and G. W. Edwards. July 24th, 1936. (Cognate application 14524/37.) (478815.)

20681. "Type-printing telegraphy." J. Estoup. June 24th, 1936. (478817.)

20737. "Electric-discharge devices." Marconi's Wireless Telegraph Co., Ltd. July 25th, 1935. (478967.)

20759. "Electron multipliers." Marconi's Wireless Telegraph Co., Ltd. July 26th, 1935. (478970.)

20769. "Cathode-ray tubes." Marconi's Wireless Telegraph Co., Ltd., and G. F. Brett. July 27th, 1936. (478971.)

20872. "Electric conductors." J. Kopetz. August 26th, 1935. (479033.)

20873. "Arrangements for keying radio transmitters." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). July 28th, 1936. (479034.)

20929. "Electric heat radiators." Morphy-Richards and D. W. Morphy. July 29th, 1936. (479039.)

20966. "Electric circuit-breakers having arc-suppressing means." G. Ellison, Ltd., and J. Anderson. July 29th, 1936. (478890.)

20999. "Means for giving protection to electric cables against mechanical damage." General Electric Co., Ltd., and S. Buckley. July 29th, 1936. (478891.)

21026. "Electric forging." G. D. M. Benedetto. July 29th, 1936. (479043.)

21036. "Variable resistances or potentiometers." Steatit-Magnesia Akt.-Ges. July 29th, 1935. (Cognate application 21037/36.) (479045.)

21038. "Variable resistances or potentiometers." Steatit-Magnesia Akt.-Ges. September 6th, 1935. (479046.)

21073. "Echo-sounding apparatus." H. Hughes & Son, Ltd., and D. O. Sproule. July 30th, 1936. (478744.)

21159. "Electric motor control systems, particularly for ship propulsion." British Thomson-Houston Co., Ltd., D. E. Jewitt and R. D. Marsh. July 30th, 1936. (479056.)

21160. "Venting means for containers of oil-immersed electrical apparatus and like liquid-filled receptacles." J. B. Hansell and Metropolitan-Vickers Electrical Co., Ltd. July 30th, 1936. (478821.)

21207. "Electro-magnetic pick-up or recording devices." Marconi's Wireless Telegraph Co., Ltd. July 31st, 1935. (479060.)

21302. "Cathode-ray devices." British Thomson-Houston Co., Ltd., and D. Gabor. July 31st, 1936. (479064.)

21544. "Electric switches having arc-preventing or limiting arrangements." General Electric Co., Ltd., and W. G. Thompson. August 5th, 1936. (479069.)

21678. "Systems and apparatus for transmitting, recording and reproducing signal modulated currents." Western Electric Co., Ltd. (Electrical Research Products, Inc., and Bell Telephone Laboratories, Inc.). August 6th, 1936. (479070.)

21709. "Asymmetric lighting fittings." General Electric Co., Ltd., S. S. Beggs and J. B. S. Smyth. August 6th, 1936. (478747.)

21821. "Anti-vibration fittings for electric lamps." General Electric Co., Ltd., and F. G. Quance. August 7th, 1936. (478748.)

22958. "Arc-extinguishing devices for electric circuit-interrupters." F. Whyman, and Metropolitan-Vickers Electrical Co., Ltd. August 20th, 1936. (478824.)

23345. "Electric oscillation systems." Hazeltine Corporation. September 28th, 1935. (478826.)

25435. "Tuning controls for wireless receiving sets." General Electric Co., Ltd., and N. R. Bligh. September 18th, 1936. (478831.)

25744. "Combined electric switch and socket units." General Electric Co., Ltd., and J. Lanham. September 22nd, 1936. (478735.)

26831. "Means of obtaining preset reaction in multi-range radio receivers." E. K. Cole and H. A. Brooke. October 3rd. 1936. (478754.)

27479. "Electric cables." Callender's Cable & Construction Co., Ltd., L. G. Brazier and G. M. Hamilton. October 9th, 1936. (478838.)

30250. "Sparking plugs for internal-combustion engines." B. Hopps and A. M. Lodge. November 6th, 1936. (478761.)

31845. "Air-space insulation of electric signalling cables." Felten & Guilleaume Carlswerke Akt.-Ges. November 27th, 1935. (478848.)

32811. "Electric medical appliances." Scholl Manufacturing Co., Ltd., and G. Thornton-Norris. November 30th, 1936 (478905.)

32833. "Radio and other high-frequency transmitters." Telefunken Ges für drahtlose telegraphie. November 30th, 1935. (478849.)

32933. "Electric cable systems." Okonite-Callender Cable Co., Inc. December 7th, 1935. (478850.)

35557. "Electric devices in which an electronic picture is projected on a projection surface." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 30th, 1935. (478852.)

35660. "Thermo-electric relays." G. E. Wagner. October 3rd, 1936. (478853.)

1937

616. "Coaxial conductor cables and spacing members therefor." Standard Telephones & Cables, Ltd. May 13th, 1936. (478768.)

1695. "Mounting electric switches on walls." A. A. Holledge, T. W. Holledge, E. G. Holton, L. Bush and F. H. Bailey. January 20th, 1937. (478770.)

3345. "Radio receivers and the like." Marconi's Wireless Telegraph Co., Ltd. September 14th, 1936. (Addition to 472739.) (478775.)

6839. "Clockwork-operated switches, more particularly for switching wireless receiving sets on or off." B. Schwedt and A. Richter (née Wagner). August 18th, 1936. (478865.)

7943. "Nut device for electric lamps, holders and other screw-threaded articles." J. McLean. March 18th, 1937. (478782.)

9983. "Electrically heated shaft furnaces." W. W. Triggs (Aktiebolaget Kanthal). April 8th, 1937. (Convention date not granted.) (478787.)

11443. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 23rd, 1936. (478926.)

12346. "Sparking plugs for internal-combustion engines." M. Delattre. April 30th, 1937. (478929.)

13188. "Amplifying systems comprising electron-discharge devices." Standard Telephones & Cables, Ltd. May 8th, 1936. (478791.)

14106. "Production of electrodes for electric accumulators." R. Dal Ponte and E. Muller. May 20th, 1937. (479081.)

14851. "Carrier-wave modulating systems." Standard Telephones & Cables, Ltd. July 7th, 1937. (478994.)

15569. "Television and like transmitters." Telefunken Ges für Drahtlose Telegraphie. June 9th, 1936. (478939.)

16274. "Line-finder circuits for telephone or like exchange systems." Mix and Genest Akt.-Ges. June 30th, 1936. (478795.)

18432. "Electric-discharge devices." British Thomson-Houston Co., Ltd. July 2nd, 1936. (478798.)

18565. "Receiving radio systems." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 6th, 1936. (478800.)

19023. "Electric-discharge devices." British Thomson-Houston Co., Ltd. July 9th, 1936. (479001.)

19053. "Selector for electric connecting systems." M. B. Richter. July 8th, 1937. (479002.)

19064. "Electric tumbler switches." A. Watson. July 9th, 1937. (478801.)

19539. "Vacuum-tube amplifiers." Standard Telephones & Cables, Ltd. September 26th, 1936. (479003.)

19740. "Electric condensers." C. Lorenz Akt.-Ges. July 16th, 1936. (478802.)

20771. "Automatic reels for flexible electric conductors." P. L. Dadina. July 27th, 1937. (478803.)

20946. "Mercury or other conducting-liquid switches." A. Cianchi. July 28th, 1936. (Divided out of 20917/36.) (Addition to 453229.) (479095.)

20962. "Loudspeaker magnet assemblies." R. Bosch Akt.-Ges. August 24th, 1936. (479006.)

22541. "Cord-pull mechanism for electric tumbler switches." A. Watson. August 17th, 1937. (478805.)

23626. "High-pressure metal-vapour discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 31st, 1936. (479011.)

1938

47. "Electric circuit-breakers having arc-suppressing means." G. Ellison, Ltd., and J. Anderson. July 29th, 1936. (Divided out of 478890.) (479097.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks be entered within one month from February 16th :—

Vico. No. 575527. Class 6. Electrically operated shaving machines.—August Vinciguerra & Co., Vienna, VI, Austria. (British representatives, E. R. Royston & Co., Tower Building, Water Street, Liverpool.)

Ranco. No. 574031. Class 8. Thermostatic and pressure-operated automatic switches for electrical circuits.—Ranco, Incorporated, Columbus, Ohio, U.S.A. (British representatives, Stevens, Langner, Parry and Rollinson, 5-9, Quality Court, Chancery Lane, W.C.2.)

Invicta. No. 581948. Class 8. Electric cables. Charles Edgar Naylor, 44, Park Road, Pendleton, Salford, Manchester.

Emerson Radio and Television (lettering and design). No. 580963. Class 8. Radio and television apparatus.—Emerson Radio and Phonograph Co., New York, U.S.A. (British representatives, Frank B. Dehn and Co., Kingsway House, 103, Kingsway, W.C.2.)

Trianco. No. 580076. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Trianco, Ltd., Trianco Works, Orchard Lane, East Molesey, Surrey.

Variac. No. 580454. Class 8. Electrical transformers (not being machines).—General Radio Co., Cambridge, Mass., U.S.A. (British representatives, Stevens, Langner, Parry and Rollinson, address as above.)

Prestomatic. No. 582244. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—The Decca Gramophone Co., Ltd., 1-3, Brixton Road, S.W.9.

AC (lettering and design). No. 582424. Class 8. Electric cables.—Aberdare Cables, Ltd., Plymouth Estate, Aberdare, Glam.

Bluex. No. 580511. Class 13. Electrodes of ordinary metal.—Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, Walthamstow.

Turbulator. No. 578886. Class 18. Switchgear installations for electric power and distributing plant.—A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Isolation block (£13,000), City Hospital; burgh surveyor.

Acton.—Factory, Telford Way; Hillier, Parker, May & Rowden, 27, Maddox Street, London, W.1.

Addington.—Flats (152), Wickham Road; F. W. Woolgar & Co.

Ashbourne (DERBYSHIRE).—Houses (58), Clifton Road site; U.D.C. surveyor.

Ashby-de-la-Zouch.—Extensions to works of Donington Pipe Co.

Banbury.—Cinema and shops, Warwick Road (£25,000); R. Satchwell, architect, 6, New Street, Birmingham.

Banffshire.—School, Keith (£10,000); County Council architect, Banff.

Barnard Castle.—Houses (23), for the North-Eastern Housing Association; G. M. Pearson, builder, Hetton.

Bath.—Fire station (£23,046); J. Long & Sons, builders, Railway Road.

Battle (SUSSEX).—Houses (26), Iden, Brede, Northiam and Ewhurst; R.D.C. surveyor, The Watch Oak, Battle.

Bebington.—Houses (22), Adaston Avenue; Wirral Housing, Ltd.

Bedford.—Cinema, Harpur Street, for G. Bacal; G. Coles, 40, Craven Street, London, W.C.2.

Billingham-on-Tees.—Cinema and shops, Station Road; E. J. Hinge's Cinemas, Ltd., 72, Grey Street, Newcastle-on-Tyne.

Birmingham.—Factory, J. Rhodes and Son, Ltd., Hospital Street; C. Tottle, contractors, West Bromwich. Premises, for Stanley Croft, Ltd., Heneage Street; E. L. Turner, architect, 204, St. Vincent Street. Factory and offices, Cambridge Street; Harrisons Buildings, Ltd., builders, Lichfield Road. Showroom and office premises, Aston Road, for Vernon Wise (Shepherds Bush), Ltd.; Clavis, Ltd., builders, Erdington. School (£30,000), Wheelers Lane, King's Heath; S. F. Swift & Son, builders, Alcester Street, Birmingham.

Birtley.—Cinema, Edwards Road; Birtley Cinema, Ltd.

Bishop's Stortford.—Houses (84), Hallingbury Road site; U.D.C. surveyor.

Blackpool.—Buildings, Whitegate Drive, for J. Parkinson, Ltd.; R. C. Walsh, architect. Development of Holme Park estate; A. A. Holt.

Blaydon-on-Tyne.—Houses (20), Hookergate Lane; T. S. Bell, builder, High Spen. Hospital (£83,000), for Blaydon, Ryton and Whickham Joint Hospital Board; Shields Bros., contractors, Swalwell, Co. Durham.

Blyth.—Houses (320), site at Cowpen Road; borough surveyor.

Boston.—Sports stadium and gymnasium (£15,000); town clerk, Municipal Buildings.

Bournemouth.—Houses (11), Cranleigh Road; F. B. Wright.

Bowburn (Co. DURHAM).—Houses (52); J. and T. Parker, builders, St. Oswald's House, Sunderland.

Bridlington.—Cinema (£40,000), for L. Morris, Shaftesbury Avenue, London, W.1; Leighton (Contractors), Ltd., Mutton Lane, Potters Bar.

Buckinghamshire.—School (£39,574), Bath Road, Twinches Lane, Slough, for the County E.C.; D. E. Cooke, county secretary.

Cirencester.—Houses (150), Chesterton; Eric Cole & Partners, architects, Dyer Street House.

Colindale.—Extensions to factory, Rookery Way, The Hyde, for Hopf Products, Ltd.; J. B. Cowper, architect, 38, Bedford Square, London, W.C.1.

Coseley.—Houses (38), Princes End (£13,300); Walton & Shakespeare, Ltd., contractors, Wednesbury.

Crook.—School (£45,306); Wright & Kellett, Ltd.

Croydon.—Art school, Fairfield (£3,275), for the E.C.

Darlaston.—Houses (24), Bentley Mill Lane; U.D.C. surveyor.

Denton.—Houses (68), Tame Street; U.D.C. surveyor, Town Hall, Denton, near Manchester.

Devonshire.—Police headquarters (£70,000) with electrical work; J. Sidey, assistant county architect.

Dorking.—Hospital (£50,000); J. F. Bagnall, secretary.

Docking.—Dwellings (36), Kenside estate, Snettisham (£15,076); F. Shanks, builder, Park Road, Hunstanton.

Dover.—Houses (161) and shop, St. Radigund's Road No. 3 and Bunker's Hill estates (£67,528); borough surveyor.

Durham.—Houses (243), various areas; H. Pescod, housing architect.

Ealing.—Flats (24), Ruislip Road; Phœnix Development Co., Ltd. Houses (194), vicinity of Eastcote Lane; Evans Bros. (Builders), Ltd. Houses (180), Edward Road. &c.; T. F. Nash Construction, Ltd. School, Laurie Road (£30,379); A. & B. Hanson, Ltd. Houses (65), Islip Manor Road; Chelmik Bros. Flats (24), Western Avenue; R. Lancaster & Sons.

Ely.—Cinema; Ely Cinema Co.

Essex.—Additions and alterations to Woodford Bridge Ray Lodge Council school, for the E.C.; J. Stuart, county architect, County Hall, Chelmsford.

Girvan (AYRSHIRE).—Houses (62); burgh surveyor.

Glasgow.—Houses, Delvin Road, Cathcart; James Laidlaw & Sons, Ltd. Cinema, Main Street; Odeon (Bridgeton), Ltd. Extensions to factory, Borron Street, Port Dundas; Distillers Co., Ltd.

Grimsby.—Factory, for Liverine, Ltd., Fraser Street. Extensions to factory, for Goldstone & Sons.

Harrow.—Brush factory building, Bruce Road; Winsor & Newton, Ltd., 38, Rathbone Place, London, W.1.

Haverton Hill.—Library (£4,616); S. Baggott, West Hartlepool.

Hertfordshire.—School, Boreham Wood, Elstree; clerk, Education Office, Hertford.

Huddersfield.—Extensions to Empress works; Lunn, Heppenstall & Lunn, architects, Milnsbridge.

Huyton (LIVERPOOL).—Houses (38), Gladstone Road and Sheppard Avenue, Bowring Park estate; Bowring Park Estate Co., Ltd.

Ireland.—(MACROOM, Co. CORK).—Houses (26); W. L. Kelleher, architect, Rockbone, Inniscarra, Co. Cork. (SLIGO).—Houses (136), for the Sligo Corporation, Town Hall, Sligo; McDonnell and Dixon, architects, 20, Ely Place, Dublin.

Isle of Ely.—Mental home, March (£42,296); county architect.

Kenley (SURREY).—Flats (40), Garston House site, Godstone Road; R. J. Sargeant.

Kent.—Hospital, Kent County Mental Hospital, Chartham Down, Canterbury, for Committee of Visitors; W. H. Robinson, county architect, Springfield, Maidstone. School, Royal Park estate, Sidcup, for the County E.C.

Lanarkshire.—Reconstruction and extension of Stevenston R.C. school (£22,530); architect, County Council.

Lanchester.—Offices and boardroom; R.D.C. surveyor.

London.—(HAMMERSMITH).—Redevelopment, Queen Street (£218,000); L.C.C. architect, County Hall, Westminster Bridge, S.E.1. (KENSINGTON).—Clinic, St. Mary Abbots' Hospital (£4,880); L.C.C. architect. (SOUTHWARK).—Rehousing Brandon Street area (£30,000); L.C.C. architect.

Ludlow.—Houses (36), Sandpits Road; borough surveyor.

Macclesfield.—Nurses' home (£14,450), Westminster Road, for Infirmary Board of Management; Cooper Bros. (Builders), Ltd., Catherine Street.

Machynlleth.—Houses (29); H. L. Fox, architect, Surgery Drive, Church Street, Oswestry.

Manchester.—Flats (123), Collyhurst; housing director, Town Hall.

Murton (Co. DURHAM).—Cinema, Coronation Street; Murton Empire Picture Co., Ltd.

Newbury.—Houses (12), Kennet Road; J. Kimber, trustees.

Newcastle-on-Tyne.—Houses (24), Pottery Bank, for the City Council; Kirk and Dickinson, builders, New Bridge Street. Flats (141), Bentinck area, Mill Lane; city architect, 18, Cloth Market.

Nottingham.—Cinema, site of Mayfield Grove Methodist Church; W. W. Cooper, architect, Queen's Chambers, King Street.

Pocklington.—Cinema, for Majestic Cinema (Pocklington), Ltd.

Portsmouth.—Houses (15), Newbolt Road; A. A. Carter. Ice rink and hall, Greetham Street; General & Sporting Properties, Ltd. Extensions to factory, Portsmouth Aerodrome, for Airspeed (1934), Ltd.

Reigate.—Houses (50), Wood Street estate, Merstham; G. G. Sanderson, borough surveyor.

Rochdale.—Municipal buildings (£100,000); borough surveyor.

St. Albans.—Additions to research station, Old London Road, for Research Association of British Flour Millers, Old London Road.

Solihull.—Extension to Solihull and Meriden Isolation Hospital (£40,000), for Hospital Committee; Councillor H. I. Pedley, chairman.

Staffordshire.—School, North End, Stafford (£35,640); county architect.

Stanmore.—Houses (40), Marsh Lane and Silveston Way; D.C. Houses, Ltd., builders.

Stoke-on-Trent.—Houses (70), near Kelvin Avenue, Sneyd Green; J. Kelly.

Tiverton.—Rebuilding factory, for Heathcoat & Son, Ltd.; W. Cowlin & Son, Ltd., contractors, Stratton Street, Bristol.

Tottenham.—Isolation hospital (£174,000); borough engineer.

Treforest (CARDIFF).—Silk printing factory, Treforest Trading estate, for South Wales and Monmouthshire Trading Estates, Ltd.; Sir Alexander Gibb & Partners, Trading Estate, Pontypridd, Glamorganshire.

Waddon.—Factory and offices, Purley Way; J. B. Rudkin & Co.

Wallsend-on-Tyne.—Extensions to works, for the Thermal Syndicate Co., Ltd.; W. T. Weir, builder, Howdon.

Walsall.—Extensions to works, for Barton Conduits, Ltd., Green Street.

Walton.—Houses (30), Cottimore Lane estate; C. Day & Sons, builders. Houses (26), Ryden's Road; Richard Hermitage, Ltd.

Washington.—Cinema, Sunderland Road, for the Southgate Cinemas, Ltd.; A. J. Lamb, architect, 16, Dean Street, Newcastle-on-Tyne.

Wednesbury.—Factory site (26 acres); H. Hope & Sons, Ltd., Halford works, Smethwick.

Wembley.—Maternity and child welfare clinic, junction Perrin Road and Watford Road, Sudbury; borough treasurer, 117a, High Road.

West Hartlepool.—Houses (30), Dyke House estate; borough engineer.

Weybridge.—Houses (38), Castle Road; L. C. Lewis, Walton-on-Thames.

Wheatley Hill (Co. DURHAM).—Cinema, The Avenue; R. W. Snaith.

Wiltshire.—County offices, Bythesea Road, Trowbridge (£150,000), for the C.C.; J. Long & Son, contractors, Bath.

Worthing.—Houses (34), Meadow Road estate; borough surveyor.